(Hello World)

Issue 29 | Mar 2026 | helloworld.cc

THE MAGAZINE FOR COMPUTING & DIGITAL MAKING EDUCATORS

FROM RESTRICTION TO EMPOWERMENT
Partnering with students on cybersecurity

ONLINE SAFETY IN THE GLOBAL SOUTH
The internet is global — online safety should be too

SOCIAL MEDIA BAN DEBATE
The case for children's rights

PLUS **CERTIFICATE IN APPLIED COMPUTING** · BLOCKLY · **DATA PARADIGMS FRAMEWORK** · SPORTS CODING PROJECTS · RESEARCH SEMINARS 2026 · **MEDIA LITERACY** · CYBERSECURITY IN SCHOOLS · **RETHINKING AI READINESS** · **NEW EXPERIENCE CS UNITS** · EDTECH LITMUS TEST · **SEMICONDUCTOR CAREERS** · PRIMM ONLINE COURSE

Raspberry Pi Foundation

Experience CS

A free integrated curriculum for computer science

Experience CS empowers educators of elementary and middle school students (aged 8 to 14) to teach computer science through a standards-aligned curriculum that integrates CS concepts into core subjects like maths, science, languages, and the arts.

Created by educators for educators, Experience CS includes:

- Ready-to-use lesson plans, educator resources, and classroom materials.
- Creative projects using a version of Scratch built especially for schools.
- Simple and intuitive learning management features to track students' progress and manage classroom assignments.
- Professional development opportunities to help you feel confident teaching CS. No prior experience needed.

Discover more at: rpf.io/exp-cs-hw29

HELLO, WORLD!

Digital safety is a foundational concern in an increasingly connected world, forcing us to confront the critical issues of cybersecurity, online risk, and the impact of newer technologies like AI and social media on young people. But how do we move beyond restriction to empowerment, equipping the next generation with the knowledge to navigate this complex digital landscape safely?

In this issue, we examine digital safety and security, and what that means for educators now. This issue is packed with insightful research, practical advice, and thoughtful strategies to reflect and adopt new ways of teaching online safety and cybersecurity in your classroom. We explore how schools can partner with students on cybersecurity (pages 18–19). We look at the nuances of online risk — how culture, inequality, and daily life influence the dangers young people face online in the Global South (pages 32–34). We also hear about the complex debate around social media bans, including Australia's case (pages 40–42).

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We feature articles on AI readiness (pages 46–47), how to introduce better career connections in CS through semiconductors (pages 76–77), and a guide to evaluating edtech tools for your classroom (pages 72–75).

With this issue of Hello World, we hope to move the conversation forward — from simply protecting young people to actively empowering them. The digital world is a shared space, and by equipping the next generation with knowledge, critical thinking, and a sense of collective responsibility, we can forge a future that is not just safe, but also rich with opportunity and innovation.

Meg Wang
Editor

FEATURED THIS ISSUE

SONIA LIVINGSTONE

'Give children their childhood back' is often the rallying cry for banning under-16s from social media. Sonia argues, on pages 42–43, that there is a way forward which better respects children's rights.

SHUCHI GROVER

A leading voice in computer science education, Shuchi joins us to discuss the evolution of her work in computational thinking. Read more on pages 44–45.

RACHEL FENICHEL

When should you use block-based programming in the classroom? Rachel discusses Blockly and how it is just as valuable as text-based programming on pages 64–65.

(HW)

Hello World is the official magazine of the Raspberry Pi Foundation

Raspberry Pi Foundation

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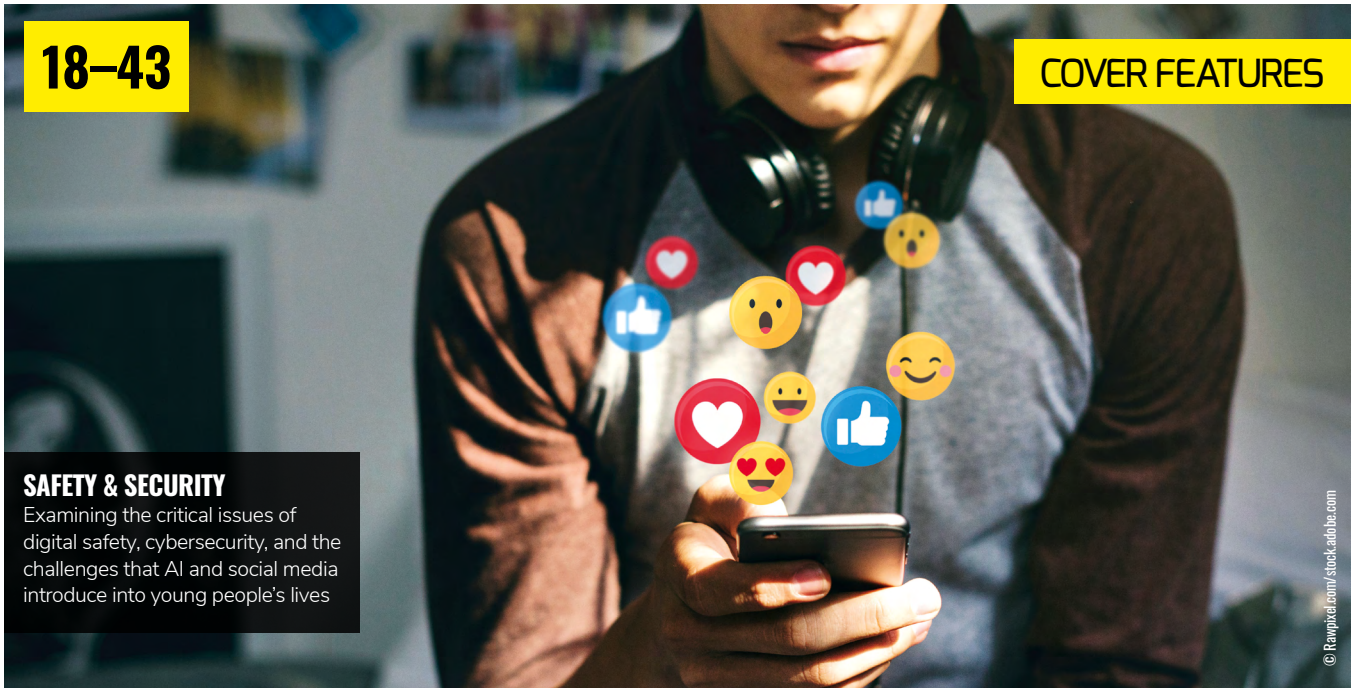

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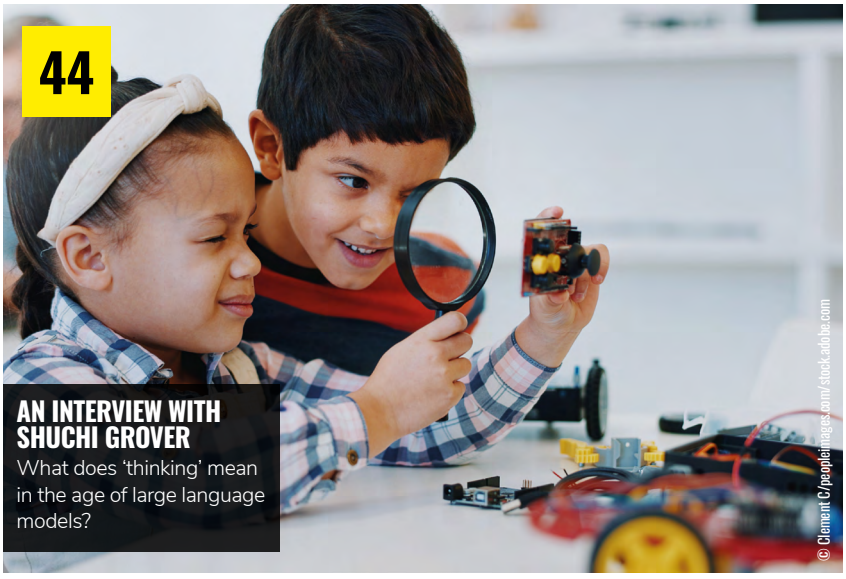

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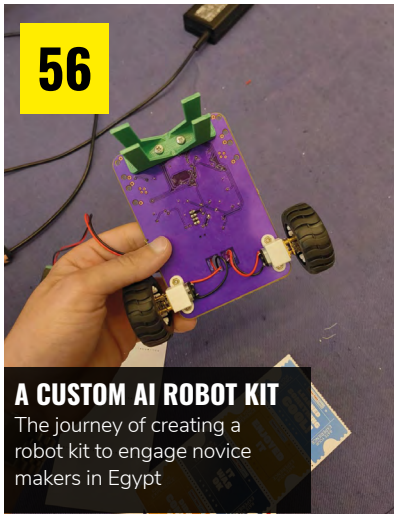

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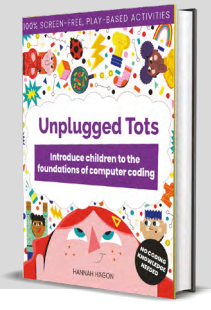


RESEARCH SEMINAR SERIES 2026

How can we teach about AI in the arts, humanities, and sciences?

Jane Waite

For the last five years, we have hosted an online seminar once a month to share computing education research. Seminars are usually organised in year-long series, with each year having a different theme. In 2025, for example, our theme was 'Teaching about AI and data science' (helloworld.cc/teaching-about-ai-seminars). In 2024, it was 'Teaching programming (with or without AI)' (helloworld.cc/teaching-programming-seminars).

It is not surprising that our focus for the last few years has been on AI technology, and we will continue this for 2026. But we will shift from showcasing how computing education research is changing teaching and learning in computing lessons, to how education research in other disciplines, such as art and geography, is starting to include teaching about AI. There are many possibilities on the horizon. For example, art lessons may change so that learners find out how professional artists use AI tools to create art. Geography lessons may change so that learners discover how professional geographers use AI tools to make predictions about physical or human aspects of geography, such as volcanic activity and global warming.

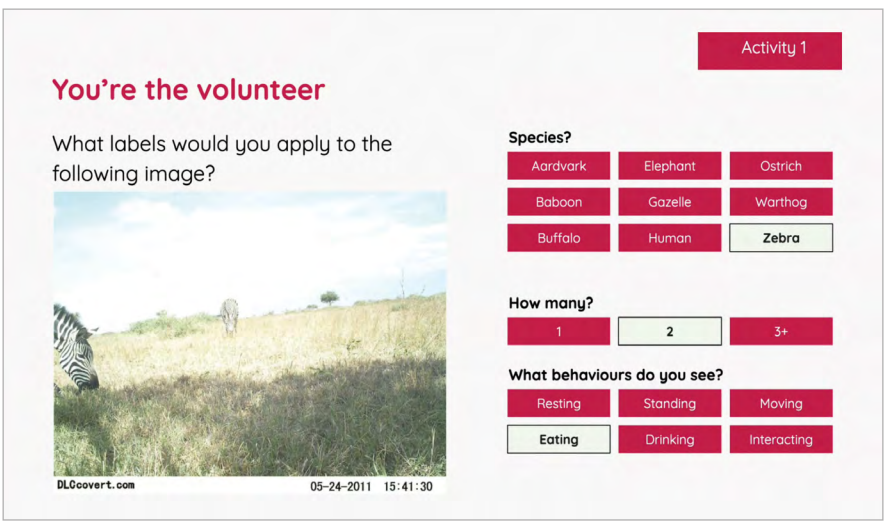
Our series for 2026 is called 'Applied AI'. This title recognises that AI technology is applied across contexts, across careers, and across disciplines, and this means what we teach across school subjects will change.

Encouraging a pull from disciplines, rather than a push from computer science

Most of the resources and professional development material related to teaching about AI have been developed by the computer science community. For example, we have developed the popular Experience AI resources in collaboration with Google DeepMind (**experience-ai.org**). In these resources, the contexts were carefully selected to represent real-world examples across disciplines, and to enable the teaching of particular technical or social and ethical concepts. This could be described as a 'push' of content from computing towards other disciplines. For example, to enable teaching about the ethical issues around plagiarism, an art context is used in the Experience AI resources; to enable teaching about the potential benefits of using AI tools, an ecological geography context is used.

AI applications are always situated within a particular topic. Most current AI applications are data-driven: vast amounts of data are collected and processed to produce models that can then either be used to generate outputs or make predictions. For example, data about artworks can be collected and used to train a model for generating outputs similar to the artworks; this is an application of AI in the art discipline. Or data on wildfires can be collected and used to train a model for making predictions about current or prospective fires; this is an application of AI in the geography discipline.

In reality, the best people to recognise how AI technology is being applied in a discipline, and what students in that discipline should be taught about these applications, are the people working in the discipline, for example



Example activity from the Experience AI resources, focused on ecology

Example activity from the Experience AI resources, focused on meteorology

> THE BEST PEOPLE TO RECOGNISE HOW AI TECHNOLOGY IS BEING APPLIED IN A DISCIPLINE ARE THE PEOPLE WORKING IN THAT DISCIPLINE

the art and geography teachers. Computer science educators can work to build technical understanding and a general social and ethical understanding that is common across applications. But it takes the community of a discipline — geographers and geography educators, artists and art educators — to truly understand the detail of how AI technology is changing that discipline.

An emerging focus

At present, though, most educators are grappling with how they can use AI tools for productivity, such as by creating lesson plans or answering emails; or they are looking at how they can use AI for general teaching and learning, for example for personalisation, say for students with additional needs. The idea that their underpinning discipline is changing is, perhaps, not yet on teachers' radar. But at universities — in undergraduate courses, for example — and in the world of work, workplace education and on-the-job training are changing. Data science courses are now being offered across university faculties. These changes will start to filter down to school-based education via curriculum change. While some resources and professional development materials addressing this shift are already becoming available, change is still fragile and patchy.

Raising awareness and building community and a common language

The aims of our Applied AI research seminar series in 2026 are to start to:

- raise awareness of the forthcoming changes that applying AI will bring to disciplines
- build a cross-discipline community
- think about a common language that could be used across disciplines

If we can start to agree on what common concepts could be taught in the arts, sciences, and humanities, it gives us a better chance to:

- understand how to use AI as it is applied in different disciplines
- help students build useful mental models and develop agency and critical-thinking skills, so that they can evaluate these applications and decide when and how to use them and how far to trust the output from such systems

JOIN OUR APPLIED AI SEMINAR SERIES

We have already arranged the following seminars across 2026 and will add more speakers for the remaining monthly slots soon. Seminars always take place online on Tuesdays, at 5 pm to 6.30 pm UK time.

- 17 March: Arts and AI — Rebecca Fiebrink (University of the Arts London, UK)
- 14 April: Healthcare and AI — Kathryn Jessen Eller (Data Science, AI & You (DSAIY) in Healthcare, USA)
- 16 June: Media literacy — Gianfranco Polizzi (University of Birmingham, UK)
- 14 July: Literacy and AI — Dan Verständig (Goethe University Frankfurt, Germany)
- 8 September: History and AI — Jie Chao (The Concord Consortium, USA)
- 6 October: Robotics and AI — Eleni Petraki & Damith Herath (University of Canberra, Australia)
- 10 November: Geography and AI — Doreen Boyd (University of Nottingham, UK)

To sign up and take part, visit **helloworld.cc/2026-seminar-signup**. We will then send you information about joining. We hope to see you there!

We need your help

To make our 2026 series a success, we need to spread the word about our seminars to groups of educators, researchers, industry figures, and policymakers across the arts, sciences, and humanities. Please tell people you know in these groups about the seminar series, and share information about it on your social media and other networks (**helloworld.cc/research-seminars**).

If you have ideas for subject associations we could connect with, or publications in which we could write about our series, please let us know at **research@raspberrypi.org**. (HW)

EXPERIENCE CS: THE JOURNEY FROM IDEA TO CLASSROOM

Confidence, curiosity, and creativity: the curriculum gets a makeover

Hedy Brown

In classrooms around the world, teachers are being asked to do more with computer science (CS) than ever before. They are expected not only to help students learn how to code, but also to help them understand how computing connects to creativity, problem-solving, and the world around us. For many educators, especially those without a CS background, this can be daunting.

From the beginning, Experience CS set out to tackle this issue and provide a free, integrated curriculum with educator voices at the fore.

The beginnings of Experience CS

The seeds of Experience CS were planted at a moment of transition. When Google's CS First came to an end, many schools found themselves without a clear, age-appropriate pathway for teaching computing in primary and middle schools. Teachers who had relied on CS First suddenly needed something new. Experience CS was developed to meet the need for a free, flexible, and school-safe way forward, while also benefitting from guidance shared by the Google CS First team.

At the Raspberry Pi Foundation, the question wasn't simply how to replace the programme. Instead, the team asked a deeper question: what would a pedagogy-backed integrated computing curriculum look like for teachers and learners today?

The answer was Experience CS: a free, integrated, and standards-aligned computer science curriculum designed for grades 3–8. Rather than treating computer science as a standalone subject, Experience CS weaves CS concepts into core subjects such as science, maths, and the arts. The goal was clear from the outset: to help educators teach computing with confidence, even if they had never taught it before.

Designed for real classrooms

One of the defining features of Experience CS is its focus on cross-curricular integration. Each unit is built around a meaningful theme that connects computing to the unit topics and to concepts from other subject areas. Students might explore weather patterns, tell personal stories, investigate communities, or create music, all while learning core computer science concepts such as sequencing, loops, conditionals, and events.

This approach helps computing feel purposeful rather than abstract. Instead of learning to code for its own sake, students use computing as a tool to express ideas,

> EXPERIENCE CS IS THE PERFECT SWEET SPOT BETWEEN CS FIRST AND CODE CLUB. THE KIDS ARE HAPPY AND LOVING THE CURRICULUM.

explore questions, and solve problems. For educators, this makes planning simpler and lessons more effective within already crowded school days.

Additionally, Experience CS was designed with teacher support in mind. Every unit includes ready-to-use lesson plans, slides, student activities, and guidance notes. Teachers don't need to be experts in computer science. The curriculum supports them step by step, highlighting key concepts and common misconceptions along the way.

A safe place to create

Another early priority was student safety. Experience CS includes a school-safe version of Scratch that is built directly into the Code Editor for Education. This version removes public sharing features and works within a closed classroom environment managed by the teacher.

Students can focus on creating and experimenting without distractions, while educators can set up classes, manage accounts, and view student work in one place. No student email addresses are required, and safeguarding concerns are kept firmly in mind.

From first release to a full curriculum

The first six units of Experience CS were released in June 2025. These initial units introduced the curriculum's integrated approach and focused on building confidence for both teachers and students. Early feedback highlighted how approachable the lessons felt and how quickly students engaged with Scratch projects that connected to engaging topics.

Over the following months, the curriculum continued to grow. New units were released throughout the year, expanding the range of themes and the grade levels covered. The existing units were also released in Spanish and French, allowing for more access and usability for learners across geographical locations. This spring, Experience CS will have reached an important milestone: 18 units in total, with three units for each grade from 3 to 8.

Rather than rushing content out all at once, the team took a more intentional approach. Teacher feedback shaped updates to lessons, platform features, and guidance materials. Teachers wanted help with getting students started with Scratch and the Code Editor for Education, so the team developed 'Unit 0: Getting Started' to overcome common barriers and set their communities up for success. This steady development reflected a core principle of the Raspberry Pi Foundation's work: building with educators, not just for them.

What students are experiencing

Across the units, students are invited to explore computing in ways that feel creative and relevant. Young learners might build interactive maths-based games or create animated self-portraits. Older students tackle bigger ideas, such as designing digital solutions for communities or creating interactive narratives that respond to user choices. By teaching concepts in different contexts, learners gain a deeper understanding of how computing works, and how it can be used in many different ways.

Building confidence, not just code

Perhaps the most important impact of Experience CS so far has been the confidence it builds. Many educators report feeling more comfortable teaching computing after using the curriculum, even if they were initially unsure where to begin. As one teacher told us: "I am confident in teaching the curriculum because it is very straightforward and well-organised."

For students, that confidence shows up in their willingness to experiment, debug, and share ideas. Scratch projects become starting points for discussion, reflection, and collaboration — not finished products.

Experience CS weaves CS concepts into core subjects for grades 3–8

Another educator shared: "Experience CS is the perfect sweet spot between CS First and Code Club. The kids are happy and loving the curriculum, and they CHEER when we tell them it's time to get ready to code."

These moments matter. Educators and students alike feel empowered by their use of Experience CS and can carry this into other aspects of their learning journeys.

Looking ahead

Although Experience CS has already reached thousands of educators and tens of thousands of students, its journey is still just beginning. Ongoing work includes refining the platform, expanding translations, providing professional development to support implementation, and continuing to listen to feedback from classrooms.

What began as a response to a gap in the available computer science content has grown into a rich, integrated curriculum shaped by educators' real needs. Experience CS shows what is possible when computing education is designed to be creative, inclusive, and grounded in quality computing pedagogy.

For teachers looking for a practical, engaging way to bring computer science into their curriculum, Experience CS offers not just lessons, but a starting point for confidence, curiosity, and creativity.

To get started with Experience CS in your school or classroom, visit **experience-cs.org** and create an account today. (HW)

THE CODING CHALLENGE

Inspiring creativity and problem-solving in future innovators

Harriet Page

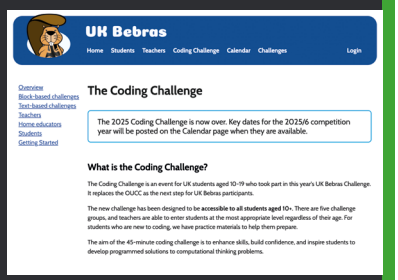
In 2025 in the UK, over 83,000 students aged 10–19 took part in the Raspberry Pi Foundation's Coding Challenge (bebras.uk). Building on the success of the Bebras Challenge, the event gave young people the chance to go beyond computational thinking and write real code to solve problems — from drawing shapes with blocks to tackling advanced algorithmic puzzles.

In a world increasingly shaped by digital technology and artificial intelligence, giving young people the chance to code is about much more than computer science. It's about preparing them to think creatively, solve problems, and shape the future — skills that will be vital no matter what career path they choose.

GET INVOLVED

The Raspberry Pi Foundation's Coding Challenge has already proven to be a powerful way to get students coding, whether they are curious beginners or advanced problem-solvers. By taking part, schools aren't just preparing students for a competition; they're equipping them with the digital skills, confidence, and creativity needed for the future.

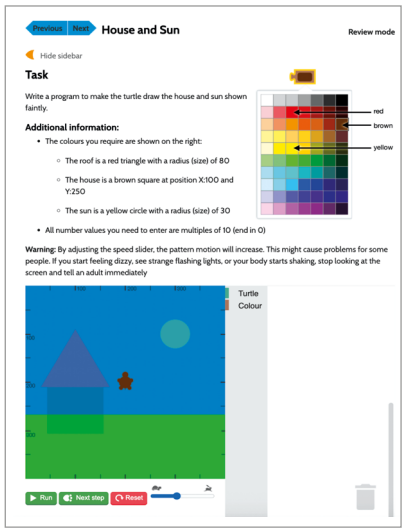
Try it out now (**bebras.uk**) or encourage your Bebras participants to continue their coding journey and join us in shaping the next generation of digital creators.



The Coding Challenge sign-up site

Levels for every learner

The Coding Challenge is open to all UK students who took part in the latest Bebras Challenge, regardless of their Bebras score (**bebras.uk**). This inclusive approach means that whether students are new to block-based coding or are budding programmers, there is a level for them: Novices, Explorers, Navigators, Pathfinders, and Trailblazers.



The 'House and Sun' task (Novices level)

The Novices level was designed for beginners using block-based programming and introduces the basics of coding, while Explorers represents a step up for more confident block-based programmers, with puzzles that required a deeper understanding of coding concepts. Navigators forms the bridge into text-based programming, where students started applying code to real-world problems. Pathfinders is for developing coders with experience, tackling more complex algorithmic challenges, and Trailblazers is the most advanced level of all, aimed at experienced young programmers ready to tackle challenging problem-solving tasks.

Why the Coding Challenge matters

The Coding Challenge isn't just about solving problems on a screen; it's about young people building skills that will last a lifetime. Students develop problem-solving and resilience as they learn to test, debug, and refine solutions, while the open-ended nature of many tasks fosters creativity and shows that there is often more than one way to succeed. By having both block-based and text-based challenges, participants gain confidence with code in a safe space where trying, failing, and succeeding are all part of the process. Schools also celebrate achievements with certificates and assemblies, boosting pride and encouraging more students to continue with computing after the challenge ends. As one deputy head teacher put it, "The puzzles were tricky but rewarding — sparking laughter, healthy competition, and plenty of 'aha!' moments."

The next Bebras Challenge

UK students aged 10–19 who took part in this year's UK Bebras Challenge are welcome to enter the Coding Challenge until the end of March 2026.

If you're based outside the UK, now is the perfect time to prepare for Bebras 2026 in November (**bebras.org**). The Bebras Challenge is a free challenge that introduces students to computational thinking through fun, accessible online puzzles, and it serves as the gateway to the Coding Challenge (see page 63 for a Bebras puzzle).

Teachers can also use practice tasks from previous years to help students build their confidence with both block-based and text-based programming, and incorporate the challenges into lessons or clubs as enrichment activities. (HW)

USING PRIMM TO TEACH PROGRAMMING

A new short course for educators

Kate Irwin and Dips Thompson

Learning to program equips young people with a powerful toolkit of problem-solving skills, creativity, and confidence with technology. But for many educators, teaching programming effectively can be challenging, particularly when learners are at different stages in their programming journey.

Ask learners to write code too early, and they might struggle or feel intimidated. Rely only on step-by-step instructions, and you could limit learners' chances to explore ideas and develop true understanding.

The PRIMM approach — Predict–Run–Investigate–Modify–Make — offers a structured way forward. It balances support with independence and helps learners build understanding before writing their own code, whatever their starting point.

To help educators use this approach confidently, the Raspberry Pi Foundation has launched a new short course, *Using PRIMM to teach programming*, on our new Training Hub platform (**helloworld.cc/training-hub**).

What is the course about?

This practical, self-paced course gives educators the knowledge needed to design and adapt programming activities to suit their learners using PRIMM.

We created the content for educators working in formal or informal settings around the world, using any block-based or text-based programming language. All that you need is some experience of creating and adapting simple programs.

The course starts with considering the five PRIMM stages, when and why to use each one, and how they work together to support learning. It covers how PRIMM aligns with key teaching principles such as scaffolding, managing cognitive load, and progression. It also examines how PRIMM supports formative assessment by making learners' thinking — and any misunderstandings — more visible.

Although pedagogy forms the core of this course, we have deliberately avoided a theory-heavy approach.

Active, social learning

Learning by doing drives this short course. Through reflection, discussion, practical tasks, and considering insights from other computing educators, participants explore how PRIMM works in real teaching contexts.

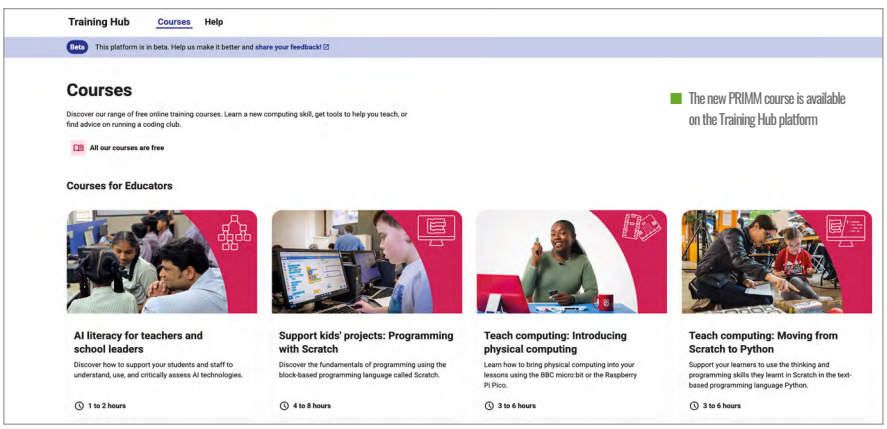
After an introduction to PRIMM's core ideas, educators design a new programming activity, or adapt an existing one, using this structure. This encourages careful thinking about what learners know and can do, likely misconceptions, and how each PRIMM stage can be used effectively, even when learners have varied learning needs and experience levels.

By grounding the course in activity design, we ensure that educators leave with resources they can use and keep adapting in their own settings. By the end, educators have a complete PRIMM activity designed specifically for their learners, and a clear sense of how to teach programming in a structured and supportive way.

Join us on the Training Hub

Using PRIMM to teach programming is available for free on the Raspberry Pi Foundation's new Training Hub, which brings together in one place our professional learning for educators. The platform offers flexible, reflective learning experiences, helping educators bring research-informed approaches into their day-to-day practice.

Whether you are an experienced computing teacher, a volunteer educator, or a parent looking to support your child's learning, we invite you to join us there. Start learning now at **rpf.io/using-primm**. (HW)



AI LITERACY IN THE INCLUSIVE CLASSROOM

How and why do we teach our students with additional learning needs and disabilities about the risks and benefits of AI?

As an educator, the recent headlines around AI are deeply unsettling to me: mainstream AI tools being misused for nudifying images (helloworld.cc/grok-undressed), AI-enabled toys marketed to toddlers engaging in inappropriate conversations (helloworld.cc/ai-toys-risk), and young people turning to chatbots for mental health advice and companionship (helloworld.cc/ai-therapy-kids). While artificial intelligence offers powerful opportunities to solve problems, save us time, and make learning more inclusive, it also brings significant risks. As educators, we must ensure learners understand not only how to use AI, but how to develop critical awareness in order to stay safe in a rapidly evolving digital world.

Education policy is starting to catch up with the rapid developments: the recent Curriculum and Assessment Review in England stated that pupils should "learn how to use AI effectively … and be engaged in the developing knowledge about both AI's strengths and limitations" (page 38, **helloworld.cc/curriculum-review**). Meanwhile, the EU's Digital Education Action Plan (2021–27) includes provisions for AI literacy (**helloworld.cc/eu-action-plan**), and a number of other countries are incorporating AI literacy into their existing digital literacy or digital citizenship programmes.

This is fantastic news if we are to ensure that our young people understand how AI works and develop the critical-thinking skills required to stay safe when using AI tools and interacting with AI-generated content — but how do we ensure that all our young people are included in this education?

Catherine Moore leads the Computing & Digital Innovation Centre in Sheffield (**helloworld.cc/learn-sheffield**), supporting schools with computing and the wider implementation of educational technology, including AI. She has over 20 years' experience of working with students with special educational needs and disabilities and their teachers, and is passionate about making computing accessible and inclusive for all learners.

Protecting vulnerable learners

The *Children and Parents: Media Use and Attitudes Report* from Ofcom, the UK's communications services regulator, details how young people are using AI (**helloworld.cc/ofcom-2025**), and the researchers also collected data about the behaviour of those with 'impacting conditions'. Impacting conditions include long-term illnesses, physical disabilities, additional learning needs, mental health challenges, and communication difficulties such as autism. The report highlights that these young people are more likely to see worrying or nasty content online, are likely to trust AI-generated news stories more than those written by a human, and may be more likely to share personal information online. This data confirms that our most vulnerable learners have the greatest need for AI literacy.

What are the key messages students need to know?

The key learning about AI for young people should start with understanding what artificial intelligence is and how it works — in particular generative AI. This knowledge helps learners to recognise why generative AI models can make mistakes and why content can be biased or perpetuate stereotypes. This includes stereotypes around disability and neurodivergence, and bias in terms of the viewpoints that are presented as the norm.

There are clearly a number of other risks associated with using generative AI that students need to learn about, for example sharing personal data, becoming over-reliant on the technology, and the use of AI to create disinformation, inappropriate images, and scams. Much of this links to existing work done in

RESOURCES FOR TEACHING LEARNERS WITH SEND ABOUT AI

Not all of these resources have been designed specifically for SEND learners, but they can all be easily adapted:

- The Safer Internet Day Resources 2026 are focused on exploring the safe and responsible use of AI. There are lesson plans and assembly plans for ages 3 to 18 (**saferinternet.org.uk**).
- Common Sense Media has AI literacy lessons for grades 6 to 12 (**helloworld.cc/common-sense-ai-lessons**).
- Code.org has a series of AI videos and lesson resources demonstrating how AI works that are engaging and suitable for a range of abilities (**code.org**).
- The Sheffield Computing & Digital Innovation Centre has written an AI literacy and relationships, sex, and health education appendix and an image-supported AI glossary. A collection of SEND-specific activities around AI is also in development (**helloworld.cc/sheffield-ai**).

online safety, relationships, and citizenship lessons around friendship, critical evaluation of online content, and being kind. Repeated messaging around safe and respectful behaviours is valuable in building digital resilience.

Alongside the negative aspects, young people should be learning about the benefits of AI: how it is being used in the wider world to solve problems, and the opportunities to support accessibility, including assistive technologies such as text-to-speech and the personalisation of content to assist learning. None of this is unique to learners with SEND, but the barriers to learning they face need to be carefully considered when deciding how to teach them.

How to teach young people with SEND about AI

There are some key points to bear in mind when teaching young people with SEND about AI, informed by the Universal Design for Learning Framework (**helloworld.cc/udl-qr**). Of course, these are fantastic approaches to use with all of your learners, and they will help you to build an inclusive classroom in which every student feels that they belong in the discussion around AI:

- Ensure that any written content is accessible for your young people. You could use AI to rewrite text at a lower reading level, provide image support, create an audio version of text for students to listen to, or preteach key vocabulary.
- Some learners have difficulties understanding abstract concepts, so provide concrete examples and practical activities to illustrate key terms. For example, a sensory activity to classify objects or sounds could be used to teach about machine learning.
- Ensure that examples are relevant and meaningful to your young people. Harnessing the specific interests of learners can also help with engagement. For example, Kopemon Machine Learning (**helloworld.cc/kopemon**) is an unplugged activity that trains students to categorise Pokémon-like creatures.
- Provide lots of examples in different contexts, to aid retention and generalisation of key messages.
- Young people with additional learning needs and communication difficulties can find it more difficult to recognise inferred risk and may be more likely to take content at face value. Make sure that any messages are clear and unambiguous, with lots of practice around the critical evaluation of online content.
- Learning about the ethics of AI can involve discussion-based lessons, which can be challenging for some learners. Provide frameworks with clear expectations for any discussion work. Carefully consider the grouping of your students and any scaffolding that might be needed, such as word banks, image support, and timers.
- Build digital resilience — rather than banning the use of AI, teach students to use it effectively and critically, in an age-appropriate context. Provide clear frameworks for students to get help if things go wrong or they see something that upsets them. Develop a safe, non-judgemental environment for students to try things out and make (small, non-impactful) mistakes.
- Provide real-world examples of how AI is used, highlight relevant careers, and, where possible, show a diverse set of role models who use AI.
- Champion learners' voices and give them a sense of ownership around AI. What do they think an acceptable use policy should contain? What concerns and questions do they have about AI?

Artificial intelligence is no longer a future concept — it is now embedded in the tools our learners use every day. For students with SEND, this means both incredible opportunities and considerable risks. As educators, our role is to ensure that our young people are not just passive consumers but confident and critical users of AI, empowering them to influence what impact this technology has on their lives. (HW)

#INSIGHTS

HOW AI SHAPES YOUR FEED: AN EXPLAINABLE SOCIAL MEDIA SIMULATOR FOR THE CLASSROOM

STORY BY Diana Kirby

Social media can have a powerful impact on the way we see and experience the world. What we see in our feeds is not random: it is determined by AI-driven systems that collect vast amounts of data, build user profiles, analyse engagement, and generate recommendations. But while young people are prolific users of social media, studies show that many have little understanding of what is happening 'under the hood'.

In our September 2025 research seminar, Henriikka Vartiainen and Matti Tedre from the University of Eastern Finland introduced Somekone (**somekone.gen-ai.fi**), a social media simulator that is designed to help learners understand some of the fundamental processes behind social media platforms. Their team has been developing AI education materials and tools since 2019, including GenAI Teachable Machine (**helloworld.cc/genai-teachable-machine**).

Collaboration and co-design

Henriikka explained that the development of the Somekone tool emerged from the team's long-term collaboration with teachers and schools in Finland. They co-developed the tool with the aim of making concepts like data collection, engagement, profiling, recommendations, filter bubbles, and polarisation visible and explainable for 11- to 13-year-old students.

A four-phase learning model

Henriikka described the pedagogical model that the team follows in all of their AI education interventions. Their goal is not only to support students to develop their understanding of AI concepts, but also to foster an ethical awareness and a sense of agency.

- **Phase 1: Contextualisation and familiarisation**
  Students begin by discussing their experiences with social media and their initial ideas about how platforms such as TikTok, YouTube, and Instagram work. This activates students' prior knowledge and helps connect the learning to their own interests. It also enables teachers to uncover any misconceptions the students may have.
- **Phase 2: Exploration**
  Students explore their initial ideas by experimenting with the Somekone tool. They discover how different types of data are collected and combined for profiling in a way that connects these new concepts to their own everyday lives.
- **Phase 3: Design and inquiry**
  Students explore the Somekone tool more deeply. Teachers guide them through activities where the students analyse, interpret, and discuss the data they can see in the tool. Importantly, the data they are using has all been gathered from their activity on the platform. Students can see how the likes, follows, and comments they and their classmates make change the images they are shown, all in real time.
- **Phase 4: Ethical and societal reflection**
  Students reflect on what they have learnt and consider the broader impacts of social media. Teachers encourage them to think critically, question the way social media platforms currently work, and imagine alternatives. At the end of the project, students write letters to decision-makers with their suggestions for how social media could better serve children's interests.

Inside the simulator

Matti then gave a live demonstration of Somekone. It showed that students log on to the tool and are then presented with an Instagram-style feed of images. They scroll through the feed and like, share, or comment on the images that catch their attention or match their interests. For many students, this is a very familiar type of environment, and they really enjoy playing with the app!

However, the unique value of Somekone is that it provides students with a real-time view

of how data is collected from every single user interaction, and demonstrates what is done with that data. It also allows students to experiment with a social media tool in the classroom without any data protection issues, as all of the data is stored locally.

Learners explore:

- **Data collection in real time.** Working in pairs, one student browses the image feed, while the other watches a live view of the data that the simulator is collecting every time their partner interacts with or simply pauses on a post.
- **Profile building**. Somekone shows how all this data accumulates to build a profile. Students watch their profiles developing based on the way they and their classmates are interacting with their feeds.
- **Clustering and connections.** Students then see how the tool groups profiles to create clusters of users with similar interests. Often friendship groups in the classroom are evident on screen, because students sitting next to each other have all chosen to engage with the same things!
- **Explainable recommendations**. A key feature of Somekone is that it provides explanations for why it recommends posts to users. Students learn that recommendations can be based on various things, such as the image's tag matching the tag on other posts they liked, or the image being popular among other users with similar profiles to theirs. These are the mechanisms that underpin real recommendation systems; Somekone makes them explicit.
- **Filter bubbles and polarisation.** A filter bubble forms when a user only sees social media posts that match their existing interests or beliefs, due to highly personalised recommendation systems. Somekone presents this concept in a visually compelling way through a heatmap showing all the content in the system, with a colour scale indicating which posts are most likely to be shown to a particular user, and which they will never encounter. By comparing different users' filter bubbles side by side, students start to understand how polarisation can arise. As Matti said: "If our feeds are so different from each other that I never see the pictures that you see and you never see the pictures I see, then … we don't even share the same reality."
- **Algorithm settings.** A key learning opportunity is that students can adjust the algorithm's parameters and observe how this changes their feed and their filter bubble. They can choose between personalised or non-personalised recommendations, select how posts are ranked, and decide whether to allow any diversity in the popularity of posts recommended to them. This is key to 'opening up the box'.

Young people are prolific users of social media, but many have little understanding of how the AI-driven systems work

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For teachers, the tool has a simple guided interface to make it easy to use in class. There is also a button that teachers can use to pause the app, stopping students from scrolling (much to their dismay!) in order to focus their attention on the teacher when they are explaining concepts.

Evidence of impact

The research team used before and after tests to evaluate what impact the intervention had on students' understanding of social media mechanisms and on their sense of agency in relation to data. They conducted the 'after' test a week after the intervention, and then did a further test six months later to see whether any changes were sustained. They found:

- **Improved understanding of key concepts.** Learners showed statistically significant improvements in identifying different types of data traces and in understanding how data profiling works. They also showed some improvement in grasping recommendation mechanisms.
- **Retention over time.** These improvements were generally still evident six months later, particularly in the case of understanding data traces.
- **Stronger sense of agency**. The team found that students' sense of data agency improved after taking part in the intervention. This is really important, as students are more likely to want to study a topic further if they have feelings of agency and self-efficacy.

Accessing the tool

The Somekone tool is freely available online in Finnish, English, German, and French, at **somekone.gen-ai.fi**. The developer Nick Pope has also made the source code available on GitHub at **github.com/knicos/genai-somekone**.

Please note that the supporting materials and teacher resources are currently available only in Finnish, and the underpinning pedagogies relate to the Finnish context.

Join our next seminar

Our series for 2026 is called 'Applied AI'. This title recognises that AI technology is applied across contexts, across careers, and across disciplines, and this means what we teach across school subjects will change.

To sign up and take part, visit **helloworld.cc/2026-seminar-signup**. We will then send you information about joining. We hope to see you there! (HW)

#INSIGHTS

A RESEARCH-LED FRAMEWORK FOR TEACHING ABOUT AI AND DATA-DRIVEN TECHNOLOGIES

STORY BY Bobby Whyte and Manni Cheung

Data-driven technologies are now routine in our everyday lives. Learners knowingly or unknowingly encounter data-driven systems such as search engines, recommendation systems, biometric authentication, and, more recently, generative AI tools. Teaching about these systems is not a straightforward extension of programming lessons because trained models rely on patterns in data, not explicit rules.

Research on AI and data science education suggests that this shift changes how learners approach problem-solving and explanation (**helloworld.cc/ct-2.0**). To improve our understanding about how to teach and learn about AI and data science, we developed the data paradigms framework, which distinguishes learning activities (1) by whether behaviour is specified through human-written rules or trained from data, and (2) by whether a model is transparent or opaque to inspection (**Figure 1**).

Knowledge-based vs. data-driven approaches

In a knowledge-based approach to system design, a set of rules (e.g. 'if–then' statements) are written for the system to execute. Every rule is explicitly defined. This approach is called 'rule-based', 'symbolic', or 'logic-based'. For example, in a classroom activity, learners can write rules for a simple dialogue simulator. They might start with, 'IF the input is 'Hello' THEN output 'Hi!'' When someone inputs 'Greetings!', the program fails as it has no rule for that specific word.

Knowledge-based models are often considered transparent because the logic is accessible and interpretable and can be traced from input to output. For example, if learners manually classify film reviews as positive or negative using a predefined set of criteria, the rules their system follows are entirely explicit, and the path from input to output is clear and explainable.

By contrast, in a data-driven approach, system behaviour is not fully defined in advance through explicit rules. Instead, data is collected and a model is trained. In the dialogue simulator example, learners would collect hundreds of examples of greetings and train a model on the pattern of a greeting. If the user types 'Greetings!', the system generates a response based on the patterns in its training data.

Data-driven models are often opaque. In other words, the internal workings of these machine learning (ML) models are hidden. While we can see our input and the system's output, the internal mathematical process is so complex — often involving layers of calculations and abstractions — that we cannot simply explain why a specific output was produced. For example, learners can create a classification model by training a neural network using thousands of images. Due to the large quantity of data used to train the model, and complex internal parameters and hidden layers, developers and users of the system cannot understand or explain the logic or features that lead to a specific output. These kinds of models are often referred to as 'black box' (as opposed to 'glass' or 'clear' box).

Researchers have argued that the move from knowledge-based (or rule-based) programming to data-driven system design represents a paradigm shift and creates unique challenges for educators. The challenge is helping learners shift away from the expectation that a system produces a single right answer — characteristic of traditional rule-based programming — and towards an understanding that systems trained on large quantities of data produce outcomes that may vary, include uncertainty, and thus aren't always fixed or explainable. If current classroom instruction still relies heavily on traditional rule-based programming approaches, we might be setting learners up for misconceptions.

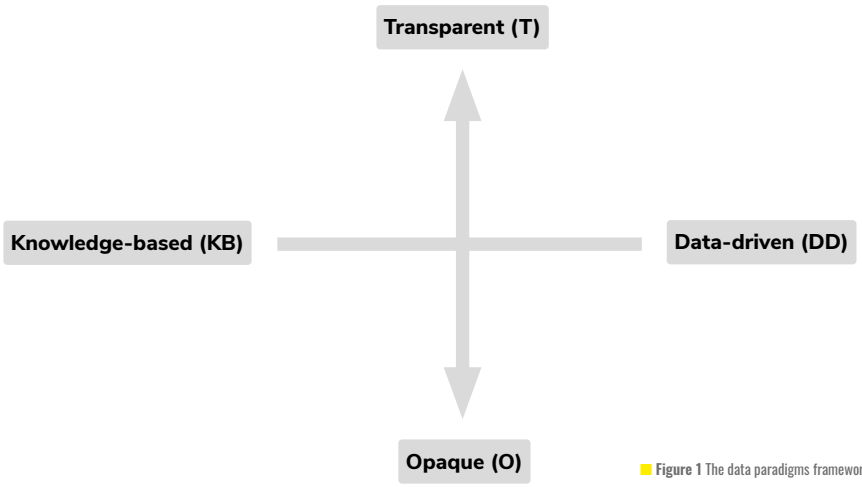


Figure 1 The data paradigms framework

FURTHER READING

Tedre, M., Denning, P., & Toivonen, T. (2021). CT 2.0. *Proceedings of the 21st Koli Calling International Conference on Computing Education Research, 3*, 1–8). Association for Computing Machinery. (**helloworld.cc/ct-2.0**)

Whyte, R., Cheung, M., Childs, K., Waite, J., & Sentance, S. (2026). Analysing data paradigms in K–12 data science activities: A systematic literature review. *Proceedings of the 20th WiPSCE Conference on Primary and Secondary Computing Education Research (WiPSCE '26)*. Association for Computing Machinery. (**helloworld.cc/data-paradigms**)

Data paradigms: a framework for analysing data science education approaches

In our ongoing work on AI and data science, we analysed 84 research studies about the teaching and learning of data science. We categorised learning activities used in the studies to understand whether they were (i) knowledge-based or data-driven, and (ii) the extent to which the underlying models were transparent or opaque. This led us to define four distinct data paradigms:

1. **Knowledge-based + Transparent (KB + T)**: activities in this paradigm involve learners writing rules for systems, or working with systems that use rules, where the logic is fully explainable by design. For example, if learners manually classify data (e.g. creating simple 'if–then' statements to predict an outcome), the path from input to output is clear.
2. **Data-driven + Transparent (DD + T)**: in this paradigm, activities involve learners working with models trained on data, but the trained model's logic remains explainable and interpretable. For example, learners might use the k-nearest neighbors (KNN) algorithm to group data points based on proximity, or use linear regression to predict a trend. Even though the model produces an output, the student can look at the inner workings of the model and inspect how a decision is made.
3. **Data-driven + Opaque (DD + O)**: activities in this paradigm require learners to work with data-driven ML models in which the internal logic is hidden and not easily inspectable, for example an image classification model using a type of neural network (e.g. convolutional neural network (CNN)). The model produces an output (e.g. classifying an image as a dog), but the student cannot inspect the system to find a rule or clear path explaining why that specific output was produced. Understanding these systems requires additional testing and evaluation tools.
4. **Knowledge-based + Opaque (KB + O)**: activities in this paradigm would involve systems with human-written rules that are not explainable. We found no examples of activities within this paradigm in our review of K–12 activities.

Using the framework in the classroom

The data paradigms framework helps distinguish between different kinds of modelling activities learners take part in and looks at how instructional approaches could be classified across one or more paradigms. Across the studies we reviewed, most data-driven activities were also opaque (DD + O) meaning that learners collected and used data to train a model, but how the system worked was not meaningfully inspectable. This pattern, where the data is visible but the model is not explainable, risks learners forming misconceptions about the capabilities and limitations of data-driven systems. Without understanding how outputs are generated, learners may expect data-driven ML systems to operate like fully explainable (or transparent) ones.

Lessons are needed in the data-driven opaque (DD + O) quadrant to explicitly teach learners about how data-driven systems work and the role they play in everyday contexts. However, when teaching data-driven opaque (DD + O) activities, learners' attention needs to be directed to concepts such as model confidence, data quality, and model evaluation. Since an ML model is not inherently explainable, we need to teach learners to use post-hoc explanation methods, such as testing different inputs to see how a system's output changes.

To prepare learners for this, we argue that first introducing activities about rule-based systems (knowledge-based + transparent, KB + T) or simple data exploration, such as linear regression or data visualisation (data-driven + transparent, DD + T), may serve as a bridge to understanding data-driven modelling by helping learners distinguish between systems built from specific logical rules and those trained on data.

We believe that the idea of data paradigms can serve as a way of framing teaching data science activities and help educators and learners consider the transition between different mental models when engaging with the systems we interact with every day. (HW)

FROM RESTRICTION TO EMPOWERMENT

How can schools partner with students on cybersecurity?

The typical mindset around cybersecurity focuses on restricting access and giving less privilege. This might involve blocking apps, sites, and tools. While this may seem helpful in safeguarding our students, it prevents them from being involved in events that surround them in the real world. Instead, educators should be collaborating with students to utilise their problem-solving skills and their different perspectives to help strengthen security. When we provide our students with real responsibility, cybersecurity improves and their learning deepens — a win–win situation for all (except the bad actors)!

Connecting learning to the real world

Many cyberattacks depend on the manipulation or error of the human mind. Our students are already tech users, but this makes them constant targets. Some students are even defenders at home, helping their grandma identify phishing emails or helping their dad improve the Wi-Fi password. Giving students real opportunities to improve their school's cybersecurity can truly improve the learning experience. When my students know they are doing a project that will be presented to our administration, they have better buy-in to the work and heightened awareness. The work they are doing turns from hypothetical to something with real impact.

Practical examples

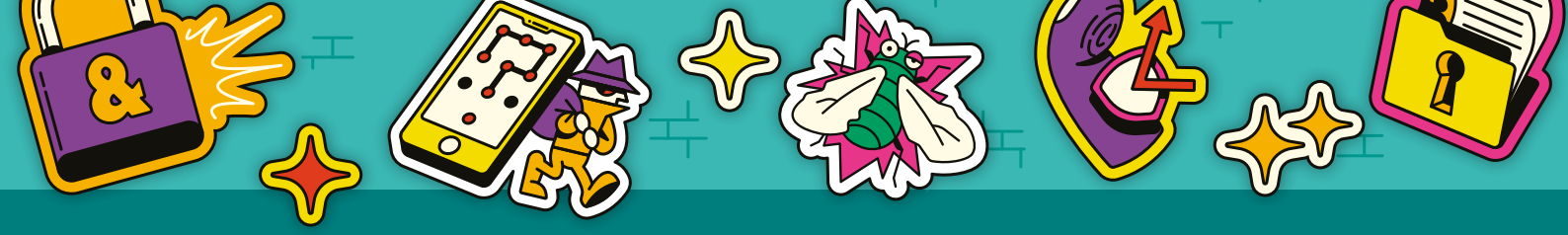
So how can you turn high-school students into threat defenders? Start by looking at the needs in your school. I often go to our IT department and administration to see current developments in our school's cybersecurity and gaps that people can fill in. I can usually work with these teams to turn the gaps into opportunities for our students.

For example, our school's IT department wanted to conduct a phishing campaign as part of our school's cybersecurity training. Instead of using a random email template from our vendor, the IT department worked with our students to craft the email. This was extremely helpful to the IT department as they were able to make a more realistic email. Meanwhile, students were able to use their social engineering skills and contextual knowledge to see how a bad actor would plan a threat. This helped them understand better how phishing emails work and how to protect themselves.

In another example, our students conducted a physical security audit on our school building. After they took some time to learn about physical security and conduct their own research, we set them free to roam the school and inspect it (of course with boundaries, and with the OK from administration). After conducting their investigations, students worked together to craft a physical security presentation in which they highlighted the positives of our school's physical security and noted areas for improvement, along with ways to handle the improvements. They then presented this to our administration, which led to a productive conversation. Our administration learnt about things that students thought could be improved, while students came to understand better why some parts of our building are designed the way they are, and why we need a good balance that meets everyone's needs.

Another effective activity is creating educational materials for the community. The weakest link in the cybersecurity chain is often a human, and training and knowledge can make a world of difference! Instead of using multiple-choice questions

Cybersecurity students speaking with an administrator about their findings during a physical security audit



A flyer crafted by students to help the community learn how to keep safe during the holidays

to test our students on the material they had learnt, we asked them to create one-page infographics explaining the material. The aesthetic and ease of reading were just as important as the information presented. Once students finished their infographics, we worked with our administration to publish them in the community through our digital communication channels. This helped create awareness about common scams and attacks in the community while also validating our students' knowledge.

Testing and planning opportunities

I have enjoyed watching students test out new apps, features, and tools in our school. Giving them time and space to tinker and find holes or misunderstandings can prove useful, especially when rolling out something new. For example, when our school began to use a new attendance tool, we had a group of students work with the company who made the tool to test it in classrooms and provide feedback. Having your students do penetration tests and find bugs in this way can give them valuable real-world experience — and a sense of pride — while also strengthening your school's cybersecurity products.

You could also try co-creating business continuity plans or disaster recovery plans with your students. If your school district already has these in place, it would be useful to have students revise them and provide suggestions. While such actions are often left to experts, students can provide useful information to help things run better, as they are often the customers and the ones most impacted by attacks. Their knowledge of their day-to-day is critical. While the recovery plans may not change a lot, students can still learn about who owns what data and responsibilities, and how activities are maintained during a disaster or attack.

VICTORIA BERKOWITZ

Victoria is a software developer turned computer science teacher. She works at Mineola High School in the USA, where she has taught game design, robotics, AP CS Principles, and cybersecurity. She is an NCWIT Educator Award Winner and the recipient of the CYBER.ORG National Educator Award. She loves all things teaching, whether it be through public schools, volunteering, or children's ministry (**@v_berkowitz**).

Dual benefits for students and school

Before including my learners in our school's cybersecurity plans, I found we were often doing work that mimicked the real stuff. Without a legitimate external need for their work, students were unmotivated and questioned the usefulness of their work. Bringing in administration and the IT department to work with students instantly changed how they conducted themselves. Giving students this real-life experience allowed them to add these activities to their LinkedIn accounts and résumés and have in-depth talking points when being interviewed. They connected with the work more easily, and I found that they retained the information better when they had real experiences to reference. Lastly, I found that my students became empowered to advocate for change, and felt more responsible for upholding the cybersecurity standards within our school.

As for the school, this all helped to strengthen the sense of cybersecurity culture. The students were becoming experts and helping their community. Our administration and IT department gained useful perspective as they made use of the students' contextual knowledge. It was very beneficial for our school staff to be aware of the cybersecurity vulnerabilities, and to know that our students were often the ones who understood exactly where those blind spots were. This helped build a collaboration mindset instead of a compliance mindset, with everyone reciprocating.

> GIVING STUDENTS REAL-LIFE EXPERIENCE HELPED THEM CONNECT WITH THE WORK

A foundation for collaboration

As an educator, this may seem like a lot of work for you, but it doesn't have to be. Find existing gaps and see how your students fit in. However, ensure you have clear boundaries. Making sure that your students know the difference between ethical hacking and malicious or black-hat hacking is a big must. Ensuring that you and your colleagues are willing to listen and collaborate is also important. It should not be a one-way conversation where students provide work. Feedback from yourself, your administration, your IT department, and your wider school is critical and helps build up your students. Viewing cybersecurity as a shared responsibility is important; it makes it easier to see how your students can participate, and how you can work together to improve cybersecurity for your whole school. (HW)

NEURODIVERSITY IN CYBER: A GUIDE FOR EDUCATORS

Tom Prosser discusses the growing importance of cybersecurity education and the need for diversity of thought within the field

Cybersecurity is becoming increasingly important in our digital world. But for cybersecurity to work for all sections of society and protect everyone equally, it is crucial to have diversity of thought.

Schools typically prioritise online safety, with cybersecurity taking a back seat — yet many students are already exposed to cybersecurity risks in their personal lives, through gaming and being online.

My first experience of cybersecurity was as a newly qualified teacher having a conversation with a Key Stage 1 (ages 5–7) child about how they had created a virus and sent it to their dad to see how it worked. Many other teachers I know have experience of students trying to find ways around their school's online filters. These inquisitive acts show how a student's technical abilities can be way ahead of their understanding of the implications of what they are doing.

While there is a need to teach only some students the intricacies of things like asymmetric encryption, all learners need to have a basic understanding of cybersecurity to keep themselves safe. They are going to be living and working in a world where they will have to manage cybersecurity risks.

TOM PROSSER

Tom works with children with additional needs as computing lead at Three Ways Special School and consulted on the Unlock Cyber SEND project (**unlockcyber.com/send**) in England. He is passionate about using assistive technologies to allow students to reach their full potential.

Future careers in cybersecurity

In conversations with employers from the cybersecurity industry, I discovered that there are lots of career opportunities. The recent high-profile hacks of companies in the UK, like Marks and Spencer and Co-op, have put cybersecurity prominently in the news, and companies are now re-evaluating the risk of attacks (**helloworld.cc/ms-cyber-attack**). The employers I spoke with wanted to emphasise the importance of working as a team and using people's different strengths. You don't have to be a coding expert; you can find roles that match your own skill set, such as network engineers, data analysts, and team leaders. Most of all, you need to like solving problems.

Employers are also keen to recruit a more neurodiverse workforce. Adjustments like working from home, online meetings, and flexible working can help with this.

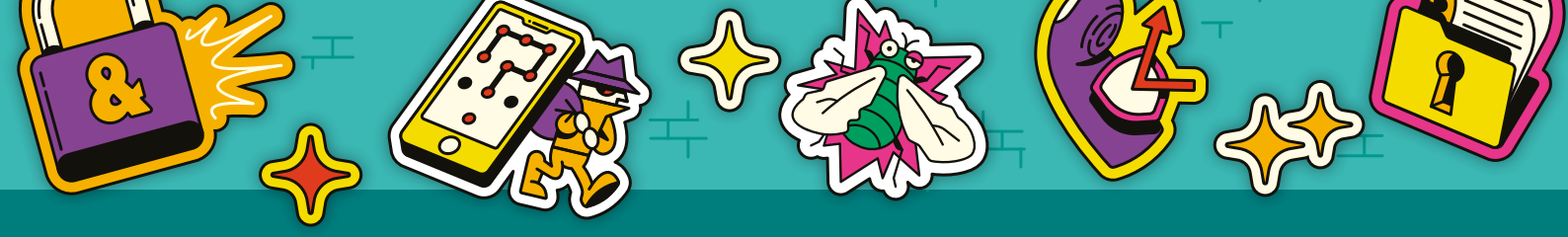
Making adaptations for neurodiverse learners

Increasing diversity is a positive step, but we need clearer career pathways radiating out from school — all students need to understand that cybersecurity is a career option. That being said, it is unlikely that we as educators will be specialists in cybersecurity, especially as it is an ever-evolving field. Sometimes it feels hard to know where to start, so I have listed some helpful tips. I've focused on neurodiverse learners, as my experience is with students with additional needs, but these principles apply equally to mainstream students.

When working with neurodiverse students, there isn't one strategy that will fit all needs. It is important that you get to know individual students and what helps them thrive.

Here are some general themes that can support you as a teacher:

- Decomposition, or breaking larger concepts into smaller parts, is crucial. Try introducing your students to common puzzles in the context of cybersecurity. Use small tasks where they find patterns, fill in crosswords, and use word searches, sudokus, and cyphers.
- SEND schools often use a cyclical curriculum where you regularly return to a concept to reinforce learning and develop ideas. It is important that students revisit previous learning and explore it in greater depth.
- Preteaching concepts and technical



language before using them in a lesson can be really helpful. You could do this through one-to-one work, short warm-up games, or unplugged activities. I highly recommend CS Unplugged for ideas (**csunplugged.org**).

- Split sessions into small parts, with more hands-on activities or physical movement breaks scheduled between more focused work. It could be as simple as standing up and moving to a different workspace.
- Visual timetables can show students how the lesson breaks down into parts and let them know where they are and what they need to do next, which can help reduce stress.
- Make abstract concepts more real by setting tasks involving real-life scenarios. Show students how tech can support them: for example, consider showing them how to use Amazon's Alexa to set reminders, or Immersive Reader to help them read text (**helloworld.cc/immersive-reader**). You can also encourage them to record their ideas in different ways, for example with a poll or Padlet (**padlet.com**). After conversations with students about their gaming, I discovered that many of them had first-hand experience of booting (where a denial of service (DoS) attack is used to push a player off a platform). I had to do some googling myself to understand the issue!

> ENGAGE STUDENTS BY EXPLORING WHAT THEY ALREADY KNOW

Most importantly, engage students by exploring what they already know and harness their interests. Neurodiverse students may have in-depth knowledge of a specialist area that you may not have covered in the curriculum. When working with students, be aware that their skills may exceed their understanding of ethics and acceptable use of technology. Try to avoid using misleading terminology like 'white hat hackers' and instead talk about the skills and approaches used. You could talk about the role of a penetration tester and emphasise that they are authorised by the company before they start. Teach students about the Computer Misuse Act 1990 using the Cyber Choices website, which has relevant scenarios and videos (**helloworld.cc/cyber-choices**).

Conclusion

As a primary-trained teacher working in special needs, I found that I had a lot of gaps in my cybersecurity knowledge. There is a lot of technical language that can be hard to penetrate. If you are starting out on your cyber journey, I recommend the following:

- England's National Centre for Computing Education (NCCE) and Barefoot Computing have free online courses. I recommend the *Introduction to Cybersecurity for Teachers* course (**helloworld.cc/intro-cyber-teachers**).
- Teach Computing and Barefoot Computing have great lesson ideas and resources that can support lesson planning (**barefootcomputing.org**).
- NCCE also has great online courses to help you understand how to adapt your computing lessons to make them more inclusive (**helloworld.cc/inclusive-classroom**).
- Explore Cyber Choices and Cyber Games (**cybergamesuk.com**) created by the UK's National Crime Agency. (HW)

HACKING THE CURRICULUM: TECHNICAL SECURITY FOR STUDENTS

Cybersecurity is about more than awareness and online safety — so what are the technical skills we should be teaching secondary learners?

As cyber incidents increasingly affect schools and educational institutions, teaching young people cybersecurity concepts has become a necessary part of K–12 education (helloworld.cc/cyber-breaches-edu). However, cybersecurity is often framed as a series of rules to follow, rather than the wide, creative discipline it really is.

While fundamentals such as using strong passwords, downloading antivirus software, and spotting phishing emails remain essential, the current GCSE and A-level computer science syllabi (for 14- to 18-year-olds) predominantly target the lower levels of Bloom's Taxonomy (**rpf.io/blooms**), focusing on remembering definitions and understanding predefined procedures. This structure often positions cybersecurity as a technical and less cognitively demanding topic compared to other areas of computer science which require higher-order thinking. In reality, cybersecurity spans cryptography, network analysis, secure coding, threat modelling, and incident response, among other creative, technical foundations that remain largely absent from classrooms.

This article explores which specific areas of cybersecurity are currently underrepresented in GCSE and A-level curricula, and how educators can develop practical, hands-on lessons that move beyond theory and demonstrate that cybersecurity is about more than memorisation. By focusing on technical concepts, we can better prepare students for the growing digital landscape that they will inevitably need to navigate in the future.

PLATFORMS AND RESOURCES

Try some of these free online platforms:

- **TryHackMe (tryhackme.com)**: guided, gamified security activities introducing core cybersecurity concepts at varied difficulty levels
- **PicoCTF (picoctf.org)**: classroom-friendly capture-the-flag (CTF) challenges in which students solve security puzzles to earn points
- **CryptoHack (cryptohack.org)**: varied cryptography puzzles best suited to more mathematically minded students
- **Hack The Box (hackthebox.com)**: more advanced, hands-on labs involving actively manipulating vulnerabilities on virtual machines

CyBOK vs. classroom content

The Cyber Security Body of Knowledge (CyBOK) is a respected framework in the cybersecurity industry that aims to collate and categorise all areas of foundational cybersecurity knowledge (**cybok.org**). Developed with academics and industry practitioners, CyBOK maps cybersecurity into distinct knowledge areas spanning both technical and sociotechnical domains. The 21 knowledge areas fit into five CyBOK categories: systems security; software and platform security; infrastructure security; human, organisational, and regulatory aspects; and attacks and defences.

When viewed alongside GCSE and A-level computer science specifications, a clear disconnect begins to emerge between the full width and breadth of cybersecurity, and what we are teaching children about it.

At GCSE level (14–16-year-olds), cybersecurity content is typically confined to a small subsection focused on threats; prevention measures; and good practice, such as malware types, authentication methods, and protective technologies which include antivirus software and firewalls. While these topics introduce important terminology, they are largely descriptive in nature, encouraging students to recall definitions rather than analysing systems or reasoning about security decisions.

Within the A-level specification (16–18-year-olds), students learn the mechanics of symmetric and asymmetric encryption, hashing, and compression, and are introduced across various modules to network security measures such as firewalls and proxies. They also study relevant legislation such as the Computer Misuse Act 1990 and the Data Protection Act 2018. While these topics are technically accurate, they are again assessed largely through explanation and recall. Cybersecurity is therefore treated as a feature of networks or data exchange, rather than as a discipline concerned with reasoning about risk and engineering solutions.

Hands-on challenges and technical activities give students a deeper, systems-oriented understanding

Learning by doing

What is notably absent from both GCSE and A-level study is the deeper, systems-oriented thinking that underpins many of the CyBOK knowledge areas. Students are encouraged to treat cybersecurity as a set of unchanging behaviours, and are rarely asked to adapt to different scenarios as a real-world practitioner would. Areas such as secure software life cycles, threat modelling, incident response, digital forensics, hardware-level attacks, and risk governance remain largely untouched. Even when legal and regulatory frameworks are covered, they are often treated as content to memorise, rather than as mechanisms that shape technical decision-making. As a result, learners encounter cybersecurity as a collection of isolated topics, perpetuating the idea that cyberattacks are situations that mysteriously happen without our knowledge of the inner workings of the system. We could be teaching students that these are processes involving identifiable vulnerabilities and traceable causes which can be analysed and understood.

The best way to learn cybersecurity is to do it. Rather than relying on students memorising material, educators could look to demonstrate the concept, and then have students replicate it in a controlled environment. For example, digital forensics can be simulated through log analysis tasks that require students to reconstruct a timeline of events. A teacher could provide students with a spreadsheet of fictional login attempts, timestamps, IP addresses, and file access records, and then ask them to reconstruct what happened on a particular day. Which account logged in at unusual times? Were there repeated failed password attempts? What kind of attacks might have occurred, and what sensitive files were accessed shortly afterwards? By observing patterns in the data and practising evidence-based reasoning, students can begin to understand how a real-life incident is investigated.

Capture-the-flag (CTF) challenges offer a structured, hands-on approach that can be easily adapted for schools. In industry, CTFs involve teams solving security puzzles to earn points, but in the classroom, this could be as simple as a task involving open-source intelligence gathering. Students could be given stock pictures and asked to use online tools to find a location — or, more simply, to extract and interpret the image's EXIF (Exchangeable Image File Format) metadata to determine when and where it was taken. At GCSE level, students already study metadata as part of data representation, learning how additional information is stored alongside files. By linking that concept to a practical cybersecurity activity, teachers can demonstrate how seemingly innocuous images can reveal sensitive information, helping to make multiple areas of the syllabus less abstract.

Introducing practical cybersecurity tasks can feel daunting. Few teachers have the time to build secure lab environments from scratch, and many do not see themselves as cybersecurity specialists. Yet this shift does not require schools to become training grounds for future penetration testers; it merely requires the reframing of existing content through a more applied lens. A number of curriculum-friendly platforms provide ready-made ethical challenges that lower the barrier to entry, several of which are listed in the boxout accompanying this article. Organisations such as the UK's National Cyber Security Centre (NCSC) also offer classroom resources, competitions, and enrichment opportunities that connect students to the wider, creative cybercommunity.

It is an exciting time for future cybersecurity practitioners, so we as educators must ensure that we respect and demonstrate the creativity within the cybersecurity discipline. (HW)

ANAHITHA VIJAY

Anahitha is a PhD candidate at the University of Cambridge, within the Raspberry Pi Computing Education Research Centre (RPCERC). Her research focuses on integrating technical cybersecurity concepts into K–12 education. A University of Warwick alumna, she is passionate about making cybersecurity education equitable and empowering all learners to have the technical knowledge needed to face cyberthreats.

NAVIGATING THE DIGITAL WORLD SAFELY

In today's tech-driven world, it's vital to ask: how safe are we, really?

My father still visits companies to pay bills in person. Neither he nor my mother uses online billing, and they avoid creating email accounts. When required to provide an email, they use mine.

Their caution stems from fear, fuelled by stories of hacked accounts and identity theft. My mother prefers a printed newspaper, feeling that it's safer than online news.

This highlights a truth: no matter how advanced our digital tools are, safety and security are not guaranteed. The fears of my parents, though seemingly old school, are not unfounded. Each digital interaction leaves data trails that can be exploited. Cybercriminals are increasingly sophisticated, and even careful users can fall prey to scams and breaches.

The question is not just about the dangers of technology, but whether we understand the risks well enough to navigate them. While we can't prevent every risk, we can use technology more wisely. Online safety is about being alert and making informed choices. Here are some habits to help keep us safe:

1. **Strong passwords are non-negotiable.** Stop reusing passwords or relying on memory. Use a password manager to guarantee complex, unique strings for your critical accounts.
2. **Two-factor authentication (2FA) or multi-factor authentication (MFA) is mandatory, not optional.** Minimise your attack surface by using 2FA or MFA.
3. **Look out for unsecured network threats.** Assume all public Wi-Fi is monitored. VPNs are your friend, but avoid sensitive financial transactions regardless.

Our parents' fears about the digital world, though seemingly old school, are valid

© Ebonie Campbell

4. **Be wary of unexpected emails.** If something feels off, don't click.
5. **Keep software updated.** Updates often fix security vulnerabilities. Stay current to stay safe.
6. **Limit online sharing.** The less personal info is shared, the less scammers have to exploit.
7. **Monitor bank and credit accounts.** Early detection of suspicious activity can prevent bigger issues.
8. **Back up important data.** Back-ups ease recovery from crashes or malware.
9. **Use reputable antivirus tools.** They add valuable protection.
10. **Trust your instincts.** If something feels wrong, pause. Scams often succeed by rushing people's decisions and using pressure tactics.

We don't have to live in fear of the digital world. While the risks are real — just ask my parents, who avoid email entirely — the solution isn't avoidance, but empowerment. Digital safety is less about advanced technology and more about building simple, consistent habits that allow you to use technology confidently without constantly worrying about being hacked. (HW)

EBONIE CAMPBELL

Ebonie is a computer science teacher at Maury High School in Norfolk, VA, USA. She is in her twelfth year of teaching and holds a BSc in computer science and an MEd, and advocates for greater representation of women and people of colour in computer science.

Young children can create strong passwords by choosing three random short words, such as RedCatApple

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CYBERSECURITY IN SCHOOLS

The hidden safeguarding risk

As schools increasingly rely on digital tools, cybersecurity has become a core part of safeguarding, not just an IT concern. A cyber incident can disrupt learning, expose student data, and directly impact student well-being. Everyone in a school community — staff, students, and leaders — has a part to play in keeping the digital environment safe and secure.

Last year, over 50,000 cybercrimes were reported by individuals. We also know that cybercrime is significantly under-reported, often because people feel nothing can be done. Despite this, small, simple steps can dramatically reduce your risk. Our free online tool, Police CyberCheck (**cybercheck.southeastcyber.police.uk/ref/10**), makes strengthening your security both manageable and achievable by guiding you through the following improvements one step at a time.

Two-step verification

One of the most effective actions you can take is to turn on two-step verification (2SV) for your online accounts — especially your main email and any social media platforms, including WhatsApp. With 2SV enabled, even if a criminal manages to steal your password, they still can't access your account. After entering your username and password, you'll be asked for a code, which is often sent by text or email. Many platforms offer even more secure options, such as authenticator apps, fingerprint recognition, or face ID. Any form of 2SV is far better than none, and most 2SV accounts can be set up in just a few minutes. Police CyberCheck will walk you through the different methods.

Strong, unique passwords

Next, make sure you use strong, unique passwords on all your accounts. Start with the most important ones — your main email, work accounts, and social media — and then work through the rest over time. The UK's National Cyber Security Centre (NCSC, **ncsc.gov.uk**) recommends using three random words, with a minimum of 13 characters, to create passwords that are strong and easy to remember. These words shouldn't obviously relate to you, so avoid choices like pet names or favourite sports teams. You can find inspiration from objects around

WHEN A CYBER INCIDENT BECOMES A SAFEGUARDING INCIDENT

A cyber breach in a school can directly impact pupil safety and well-being. Consider these safeguarding risks:

- **Staff email accounts are compromised**
  Confidential safeguarding records, referrals, notes, or pupil disclosures may be accessed or leaked.
- **Ransomware locks access to systems**
  SEND information, medical plans, behaviour logs, and pastoral records may be unavailable when urgently needed.
- **Pupil data is stolen in a breach**
  Names, addresses, photos, or login details could be used for grooming, fraud, or targeted exploitation.
- **Parent communication channels are hijacked**
  Attackers may impersonate the school to send harmful links, request payments, or target vulnerable families.
- **Learning platforms are disrupted**
  Pupils, particularly those already at risk, may be unable to access online learning or well-being support systems.

Cybersecurity is safeguarding, and protecting children now depends on protecting their digital environment.

you or anything you come across online. For example, WindowHotterRobot is a 17-character password that is memorable and quick to type.

Some services require numbers or symbols. Focus on length rather than substitution (criminals know that 'P@ssw0rd' is really 'Password'). Instead, add extra characters — for example, turning WindowHotterRobot into Window&Hotter9Robot, increasing the length (now 19 characters) and therefore the strength.

Remembering multiple long passwords can feel daunting. Police CyberCheck provides guidance on secure strategies, such as using a password manager, which is covered in the 'Improver' tier of our steps.

Check for data breaches

Cyberattacks on organisations frequently lead to data breaches, which may include usernames and passwords. Criminals can use this information to break into your accounts, making 2SV even more essential. You can check whether your email address has appeared in any known breaches using the free, independent website **HaveIBeenPwned.com** — a useful insight into what criminals might already know! Police CyberCheck also offers advice on what to do if your information has been compromised.

the system. Once one username is leaked, the rest will fall like dominoes.

The National Cyber Security Centre recommends using three random words to create strong, phishing-resistant passwords. If this is best practice for adults, why not introduce the same approach from the very beginning of a child's digital journey?

For Key Stage 1 pupils (ages 5–7), this can start simply — for example, by combining three short words such as RedCatApple. As pupils get older, you can gradually increase the complexity and length of passwords, working towards the recommended minimum of 13 characters. A password such as PlantMusicLondon (16 characters) is both memorable and significantly more secure.

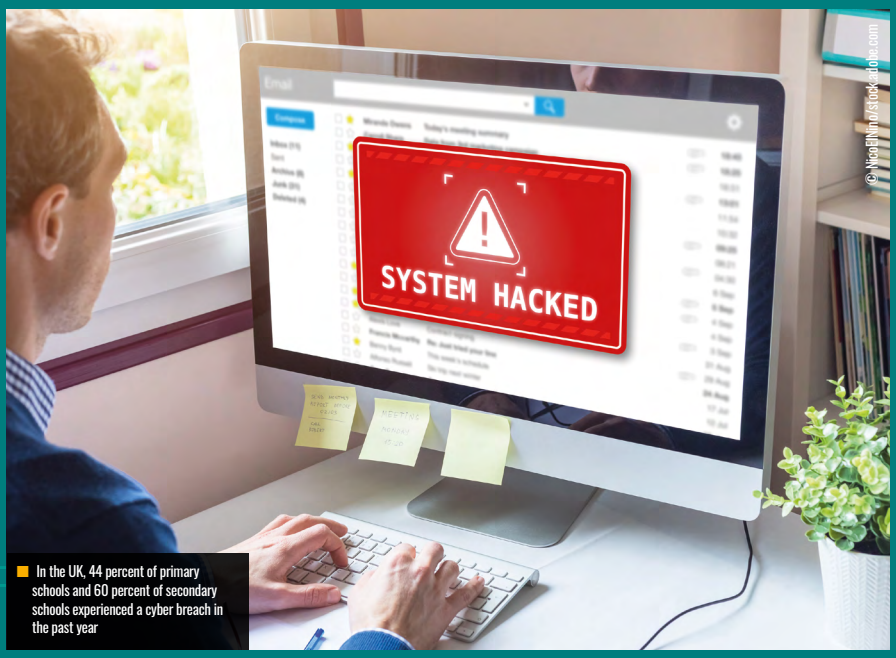
Our team delivers cybersecurity sessions for pupils from Key Stage 2 to Key Stage 4 (ages 7–16), covering age-appropriate risks, how attacks happen, and practical steps to stay safe. These sessions use real-world examples and form part of our wider, fully funded package of support for schools. We also highlight a range of high-quality teaching resources to support digital skills development (**helloworld.cc/police-cyber-resources**).

> MANAGING CYBERSECURITY RISKS TAKES JUDGEMENT AND LEADERSHIP

Cybersecurity for pupils

Schools increasingly use online platforms for pupils such as Times Tables Rock Stars, Google Classroom, and Microsoft Teams. However, pupil accounts are often protected with short passwords that are easy to guess, and usernames frequently follow predictable patterns. This makes them vulnerable to being cracked by anyone with basic knowledge of

Cybersecurity is safeguarding because it protects the digital environments that children rely on every day



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In the UK, 44 percent of primary schools and 60 percent of secondary schools experienced a cyber breach in the past year

POLICE CYBERCHECK

Police CyberCheck supports you in making improvements to your online security, one step at a time. No installation or registration is necessary.

Search online for Police CyberCheck, visit **cybercheck.southeastcyber.police.uk/ref/10**, or scan the QR code.

Protect others — share with your colleagues and the wider school community, as well as family and friends!

Cybersecurity for schools and leadership

Recent findings from the UK's Department for Science, Innovation and Technology (DSIT) Cyber Security Breaches Survey 2025: Education Institutions (**helloworld.cc/cyber-breaches-edu**) show that 44 percent of primary schools and 60 percent of secondary schools experienced a cyber breach in the past year. In the very week we wrote this article, four more schools in our region suffered incidents ranging from phishing emails to ransomware attacks. These numbers are not simply operational concerns — every one of these incidents carries direct safeguarding implications for pupils.

When a school experiences a cyber incident, the impact can reach far beyond IT systems. Phishing compromises can expose staff inboxes containing sensitive safeguarding information. Ransomware can block access to special educational needs and disabilities (SEND) records, care plans, and pastoral notes at the exact moment a child needs support. Compromised parent communication channels can be used to send malicious links or impersonate school staff. Cyberthreats are no longer separate from safeguarding — they sit right at the heart of how schools keep children safe.

Yet many teachers and school leaders still feel that cybersecurity is 'technical' and the responsibility of IT teams. In reality, effective cybersecurity is safeguarding, because it protects the data, communication channels, and digital environments children rely on every day. Managing these risks requires whole-school awareness, judgement, and leadership — not just technical skills.

This is why the UK's Department for Education's (DfE) Digital and Technology Standards, supported by NCSC guidance, are so important. Designed specifically for schools, the standards set out the baseline expectations needed to protect pupil data, maintain safe and reliable digital systems, and uphold wider safeguarding duties under statutory guidance such as 'Keeping Children Safe in Education' (**helloworld.cc/keeping-safe**).

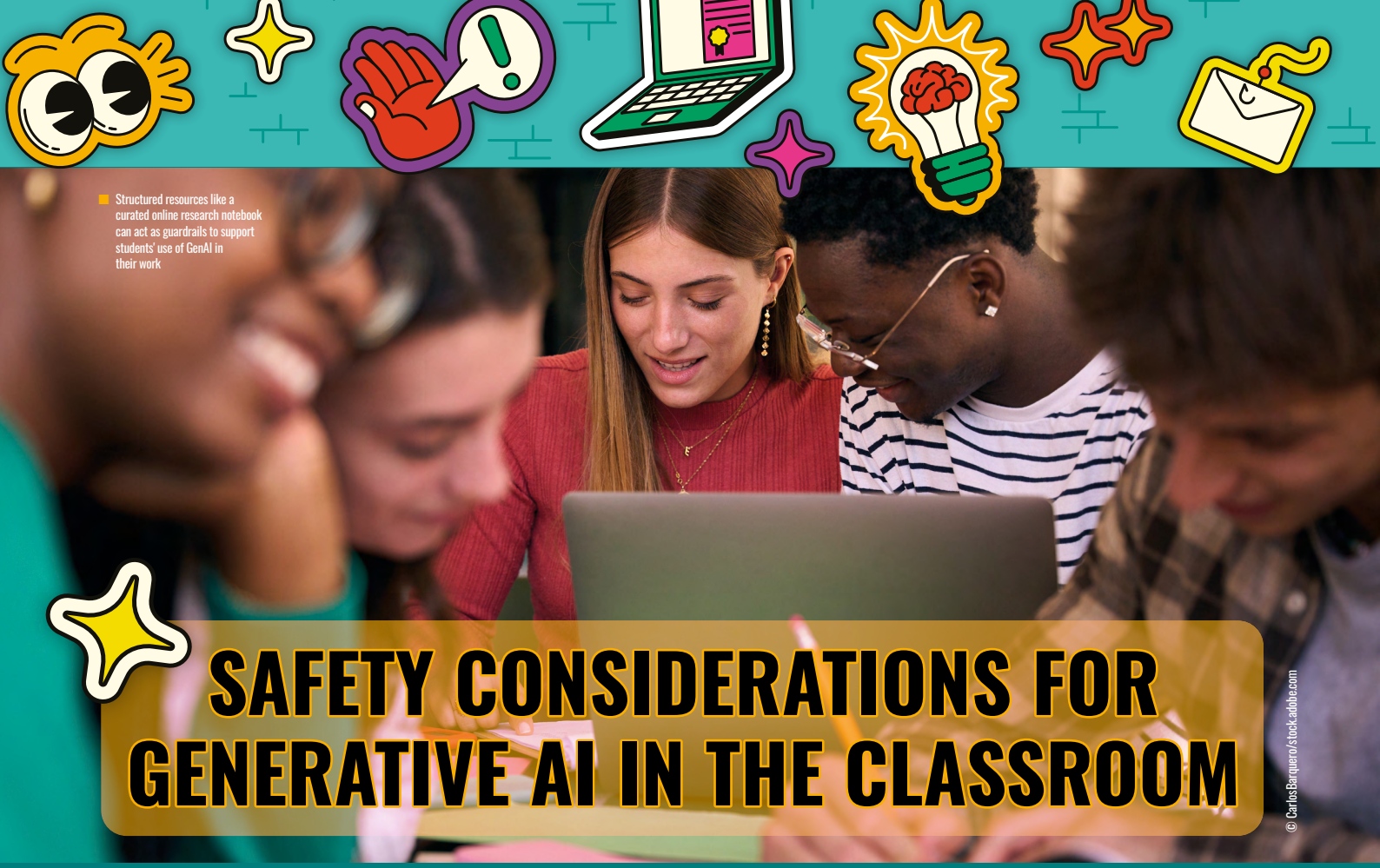
The standards are organised into six core areas, including cybersecurity, filtering and monitoring, and digital leadership and governance. While some technical elements will be supported by your IT provider, the core of the standards is about risk management and safeguarding oversight — areas where teachers, senior leaders, and governors already have established expertise.

To help schools understand their current position, identify gaps, and plan long-term improvements, the DfE has developed the 'Plan Technology for Your School' tool (**helloworld.cc/plan-technology**).

Cybersecurity may feel technical, but its purpose is simple: protect pupils, protect their information, and protect their learning. Strong cybersecurity protects not only data, but continuity of learning, trusted communication with families, and staff confidence in supporting vulnerable pupils. By taking small steps, building whole-school awareness, and aligning with the DfE Standards, schools can create safer, more resilient digital environments for every pupil. (HW)

CLAIRE WALDEN

Claire is a Cyber Protect Officer for Thames Valley Police in England, delivering cybersecurity awareness training to various audiences. Her prior experience as a school teacher gives her insight into the specific challenges around cybersecurity faced by schools.



Structured resources like a curated online research notebook can act as guardrails to support students' use of GenAI in their work

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SAFETY CONSIDERATIONS FOR GENERATIVE AI IN THE CLASSROOM

Chanel Belvin addresses GenAI safety in the classroom, focusing on protecting students and their data

Data is the most valuable resource that we have. Businesses want our data to create targeted advertisements that encourage us to buy their products. Bad actors want our data to steal our identities or financial assets. Generative AI (GenAI) companies want our data to train their models and make predictions when responding to queries.

Our data tells a story about who we are and what we value. As more companies incorporate AI into their business models to process our information even faster, and hackers with very little computer science knowledge can spin up an AI bot on the hunt for our identities, protecting our data is paramount.

AI and cybersecurity education

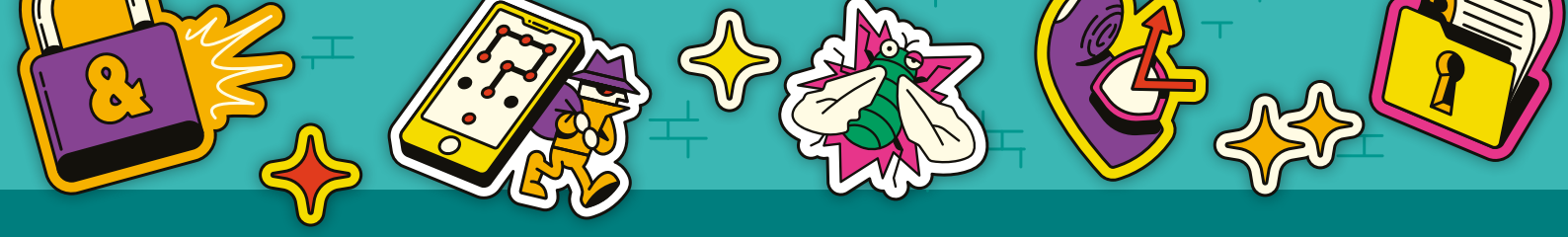
I recently conducted a survey with cybersecurity partners and high-school teachers to discover the most significant topics that students should become familiar with at the intersection of artificial intelligence and cybersecurity. Both agreed that students need to understand the fundamental concepts of cybersecurity and the threats to data that AI systems pose.

The reality is that the systems that have been in place since the start of modern computing are the same basic systems that undergird the AI systems that are exploding in popularity today. These systems are based on input, analysis, and output, with significant speed increases. It is imperative that K–12 educators and the students in our classrooms know what artificial intelligence is, what its limitations are, and how to leverage these tools in a safe manner to encourage learning, creativity, and privacy protection.

What is GenAI?

Large language models (LLMs) are trained using text or other content found on the internet, or from other curated sources, to predict which words are most likely to come next when creating text and to sort images based on their features. A simple example of this type of training would be to have a model distinguish between what is a cow and what is not a cow. We would provide some examples and non-examples of cows and test the model repeatedly until we felt confident that the model could reliably identify cows based on their characteristics. You can test this out yourself by going to **helloworld.cc/teachable-machine** and training a model.

When we talk about the current usage of AI, the conversation usually centres around a specific subset of artificial intelligence tools, namely GenAI, which includes ChatGPT, Copilot, and Claude. GenAI allows us to leverage the power of LLMs, neural networks, and deep learning to generate responses that can assist us with creating lesson plans, outlines, images, and even videos based on a given context. GenAI goes further than simple classification. It takes what the user inputs and generates content that fits with the expected output. This can assist with finding a quick answer to a question, tailoring an email to a particular audience, or brainstorming ideas



for a new book title. These tools can have a positive impact on productivity and assist with more mundane work tasks, freeing up time for the more challenging aspects of work. Generating images for a project, or music based on a certain genre, are tasks that can be accomplished in mere seconds with a detailed prompt.

However, there are disadvantages to using GenAI. It can be subject to something called 'hallucinations' if it cannot find the correct answer for your context. In other words, it will just make something up. In a learning context, if the instructor is not careful, a lesson can include erroneous information. Work that sounds legitimate can be false, or worse, misleading and attributed to an incorrect source. GenAI can make up citations, historical events, and sources. It is more important than ever to train students to check the origins of the information and not just accept the information that GenAI systems provide. An option that can help is using a curated research notebook loaded with resources provided by the teacher. The students will then be able to create prompts that relate to the content the class is studying, and the teacher can ensure all sources are accurate. The available options include Google's NotebookLM (**notebooklm.google**) and a free and open-source project called Open Notebook (**open-notebook.ai**). Placing guardrails on the material that educators expose their students to is good practice.

> IT IS IMPERATIVE THAT EDUCATORS AND STUDENTS KNOW THE LIMITATIONS OF AI

Safety concerns in the classroom

A safety concern that needs to be addressed within the context of the classroom setting is the data that teachers and students input into GenAI systems. Student privacy is not only an ethical issue, but a legal one. When using these tools, it is important to understand how the data collected by the tools is used. Reading the end-user licence agreement will explain whether the data that is being uploaded is used to train the models. It is important to keep in mind that once private data is uploaded to these tools, there is a potential for that data to be used in a way that was not initially intended. When using GenAI tools with students, try to use tools that provide an environment that does not store uploaded data in its systems. When teaching students about AI, simulated environments provide a safe space for them to practise generating prompts with no actual connection to a generative AI model. Code.org's Hour of AI (**helloworld.cc/hour-of-ai**) provides this type of environment; students can learn about the basics of GenAI without putting their privacy at risk.

AI social companions

An even more pressing safety issue for students using GenAI tools is their use as social companions. Communication with others is increasingly occurring within a virtual space, and feeling isolated from peers and a need to be heard can lead students to engage with GenAI chatbots to seek guidance or feel that they have a friend to confide in. According to a recent report by Common Sense Media (**helloworld.cc/common-sense-ai**), three out of four teenagers have used or are currently using AI companions. Behind these companions are algorithms that are not capable of emotions, ethical considerations, or any knowledge of the development of the adolescent mind. Several lawsuits are currently dealing with the impact that GenAI companions have had on teens in mental health crises. One notable case is that of a college student who was supported by one such GenAI tool in his decision to commit suicide (**helloworld.cc/chatbot-teen-suicide**).

The decision to introduce these GenAI tools to students should be made with careful deliberation on the objective for using the tool and a careful exploration of alternative activities that might be safer to use but still meet the overall goal of a lesson.

Responsible GenAI integration

Even though there are major concerns about the safety of GenAI tools in the education setting, these tools can still be leveraged to increase student engagement and enhance learning. It is important to train students in digital literacy and ethics. Addressing the appropriate use of GenAI tools, fact-checking, and analysing the generated output are important skills for students to learn and should be a part of the objectives for any lesson that requires or allows the use of these tools. Students should be taught the limitations of the information provided by GenAI and learn how to use it as a starting point for further learning. Guardrails should be provided so that students are not placed at risk of having their personal data used for model training, or being exposed to information or interactions that could be harmful. If these safety concerns are carefully considered, GenAI tools can have a powerful impact in the classroom. (HW)

CHANEL BELVIN

Chanel is a CS education specialist at the Texas Advanced Computing Center at the University of Texas at Austin, USA. She has 15 years of teaching experience in the K–12 setting and an MS in CS, and is CompTIA Network+ and Security+ certified.

WHY IS ONLINE SAFETY EDUCATION FOR CHILDREN IMPORTANT?

Mahima Sashank explores learnings from schools across Asia

A teenage girl in Nepal received a notification on her Facebook account. She opened it. It was a strange message. Someone she didn't know was inviting her to play a game and win prize money. She could have clicked it, or simply ignored it. But she did neither.

She blocked the suspicious account and reported it, and asked her friends to report it too. The question is, where did she learn how to respond so smartly?

It was at her school, during an online safety awareness session. This two-hour lesson was led by youth volunteers from Terre des Hommes Netherlands (TdH NL), a global child rights organisation, as part of TdH NL's Safety for Children and their Rights OnLine (SCROL) programme in Nepal (**helloworld.cc/scrol**). After only one session, children's knowledge of safe online practices increased by an average of 20 percent.

Standalone awareness sessions produce results, but are they enough? They are a good first step, but ideally we need comprehensive and systematic approaches.

Online dangers for children today

Such approaches are critical in a world where 300 million children experience online abuse (**helloworld.cc/300m**). Online child sexual exploitation can take the form of:

- Online grooming — where predators manipulate emotional connections with children to exploit them
- Sexual extortion — where predators threaten to expose explicit images and demand money or additional materials
- Sale of child sexual abuse materials (CSAM) or use of AI to generate CSAM

Children use the internet on a daily basis. Strong structural mechanisms are needed to reach out to children, ensuring their safety in the virtual world by establishing deep-rooted interventions on a large scale. That's where educational systems come in.

A curriculum approach

The centre of an education system is its curriculum. This provides a framework for accountability, credibility, and evaluation. Integrating online safety lessons in subjects, lessons, and assignments creates reliable mechanisms for consistent, measurable, and sustainable teaching and learning.

How can integration be achieved? Let's look back at the SCROL programme in Nepal as an example. This programme conducted an intensive advocacy exercise with Nepal's Curriculum Development Centre (CDC) under the Ministry of Education, Science and Technology about including online safety lessons in the computer science school curriculum.

"Advocacy interventions with institutions is a long-term process. It requires strong commitment and collaborative efforts. We have been working closely with relevant ministries in Nepal for online safety curriculum integration for many years, including forming a multi-ministry task force to finalise content," says Zoe de Melo, the global programme manager at TdH NL who is leading the SCROL programme.

This effort bore fruit. In June 2025, learnings about the prevention of online child exploitation were included in unit 6 of Nepal's national computer science curriculum for grade 9 (14- to 15-year-olds, **helloworld.cc/cs9**), a key milestone for systemic change. The CDC has committed to adapting and integrating the content to other grades in due course.

"The inclusion of online issues in our textbooks is a big step forward: it means every student can now learn how to stay safe online," says a grade 9 student from Nepal.

This advocacy success is only the beginning, though. To ensure policy is effective in practice, the school ecosystems must support educators so they can effectively teach the new textbook content and other online safety initiatives.

Training teachers on online safety

This begins with training teachers — a crucial step in delivering successful education policy

Prum Sopheap, a teacher at a public school in Phnom Penh, Cambodia

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practice. If teachers lack knowledge and pedagogical skill on the subject, curriculum changes will be superficial.

The SCROL programme in Cambodia actively involved teachers by equipping them with the necessary knowledge, skills, and tools. Prum Sopheap is a science teacher at a public school in Phnom Penh, Cambodia. In 2024, she was enrolled in SCROL's online safety teaching training programme.

"We learnt how online exploitation works, and its prevention methods. We were given supporting materials," she says, referring to the training programme. "This was a wake-up call and an important lesson for me, our children, and society."

Ms Sopheap now teaches online safety lessons to her grade 9 and 10 students (ages 14 to 16). She focuses on ways to be careful online — activating privacy settings, avoiding vulnerability and confiding in guardians, and practising caution while playing online games.

A student in Nepal looks at her mobile phone with a SCROL educator

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SCROL has equipped several other teachers like Ms Sopheap across Cambodia, Nepal, and the Philippines.

STRONG STRUCTURAL MECHANISMS ARE NEEDED FOR CHILDREN'S DIGITAL SAFETY

Integrating online safety in extracurricular activities

Another systemic approach to online safety education is creating physical spaces where children can access online safety content.

In the Philippines, Cyber Caravans are a mobile and community-friendly learning experience with various physical booths where children can immerse themselves in interactive awareness-oriented activities. SCROL participated in an online safety Cyber Caravan, which included virtual reality games where young people could explore an abuse awareness detection mobile application, talk about reporting pathways, and even access 'breathing' spaces to release emotional stress.

These Cyber Caravans actively reached out to private and public schools in the Visayas region, following a collaborative approach with educational institutions.

"Cyber Caravan activities are designed around experiential learning, recognising that children learn best through active engagement, reflection, and play that breaks complex ideas into simple, manageable experiences. By using interactive and playful activities that allow children to make choices, receive feedback, and connect with peers, learning becomes more meaningful, motivating, and memorable", says Judith Pulvera, SCROL project coordinator of Bidlisiw Foundation in the Philippines, an implementing partner of TdH NL.

Taking the learnings forward

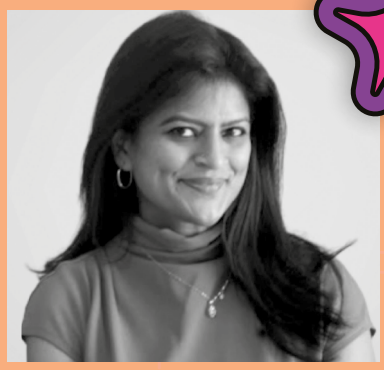
While the above examples are contextual, their scope is globally relevant. To replicate them effectively, it helps to understand one's particular context — the problem, the goal, and capacity — and find pathways to the meaningful integration of digital literacy into education systems, so that learning has a strong foundation and growth is nurtured.

Equipping children with the tools to protect themselves online must therefore be part of their everyday learning, just like reading or maths. This way, they will not only be informed, but also empowered to protect themselves and others.

Systemic changes in education hold the key to building a safer digital future for children. Stakeholders must recognise this and begin to work together. Collaboration, cross-learning, and coordinated efforts are key. As was rightly pointed out by a youth advocate from TdH NL, "We are all joined together in this virtual universe."

Learn more about the SCROL programme here: **helloworld.cc/scrol-report**.

For more information, reach out to Zoe de Melo, global programme manager, at **z.demelo@tdh.nl**. (HW)



MAHIMA SASHANK

Mahima is regional communications adviser for Asia at Terre des Hommes Netherlands. A strategic communications professional certified by the London School of Economics and Political Science, she leads and supports impact communication strategies across six countries in South and Southeast Asia (**linkedin.com/in/mahimasashank**).

YOUTH ONLINE SAFETY IN THE GLOBAL SOUTH

The internet is global — safety should be too

Conversations around youth online safety often assume that young people everywhere use the internet in similar ways, face similar risks, and need similar solutions. Yet these assumptions fail to account for the experiences of youth outside of the Global North and Western contexts. While the internet may technically be global, the conditions under which young people access, use, and make sense of it vary across regions.

In many parts of the Global South, digital access is shaped by shared devices, unstable connections, and high data costs. As such, online participation is often negotiated within families, schools, and communities that hold strong expectations about obedience, respectability, and moral behaviour. These conditions fundamentally change how safety is implemented and how risks are experienced. This article unpacks why youth online safety cannot be understood without attending to these broader realities. Drawing from a systematic review of research across the Global South, synthesising data from 66 research papers (**helloworld.cc/oguine**), we discuss how culture, inequality, and daily life shape not only the risks young people face online, but also the strategies they use to stay safe. This reflection matters because teaching online safety without examining these conditions risks reinforcing approaches that overlook how social, cultural, and family contexts shape youths' online experiences.

Who, how, and what is studied, and why it matters

Research on youth online safety in the Global South is growing, but still tends to be clustered in particular regions, as shown in **Table 1**. Much of the existing work comes from parts of Southeast Asia. Studies from African countries appear less frequently and are dispersed across a range of national contexts, while research from South America remains relatively sparse.

These patterns do not necessarily reflect where online safety challenges are most urgent. Instead, they indicate the relative strength of a country's research and technology ecosystem (**helloworld.cc/firestone**, **helloworld.cc/gsma**); that is, a country's research capacity and access to publication opportunities across nations. For example, many high-impact conferences and journals operate in English, and research funding tends to be more consistently available within certain national systems. As a result, scholars in those countries have greater opportunities to publish and share their work. Therefore, higher representation in the literature should not be taken as evidence of a higher prevalence of online risks for youth. Instead, they largely mirror where research infrastructure, funding, language access, and publication pipelines are most established.

Importantly, much of the research conducted in the Global South is led by scholars affiliated with institutions in the region. These researchers are closely connected to the social, cultural, and political realities of the communities they study and bring deep local knowledge to their work. However, their findings do not always reach global policy discussions, where evidence from a small number of countries is often treated as representative.

Cyberbullying and online victimisation dominate youth online safety research

OZIOMA C. OGUINE & DR KARLA BADILLO-URQUIOLA

Ozioma and Karla are human–computer interaction researchers specialising in youth online safety and well-being. Using community-based critical design methods, they investigate how technology impacts vulnerable populations and they advocate for more equitable, ethical, and safe digital futures.

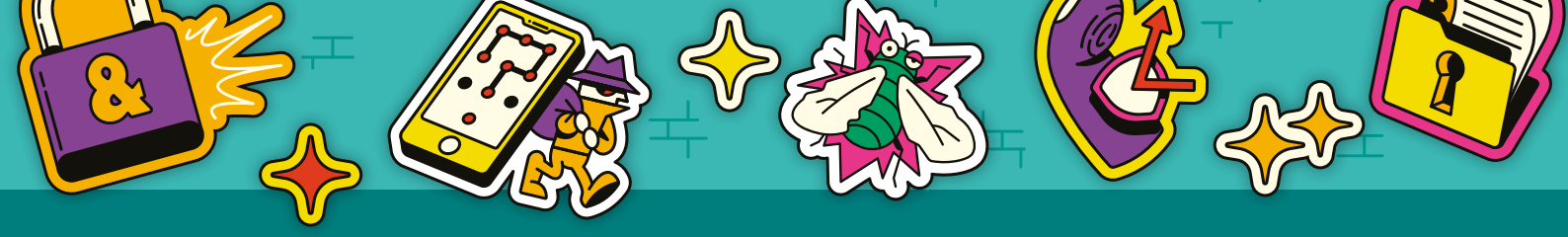


TABLE 1: GEOGRAPHIC LANDSCAPE ON YOUTH ONLINE SAFETY RESEARCH (2014–24) BASED ON A SAMPLE OF 66 PAPERS

Global South region	Countries (number of articles)	No. of countries
Africa	Eritrea (1), Kenya (2), Namibia (3), Nigeria (2), South Africa (4), The Gambia (1)	6
Eastern Asia	China (11)	1
South America	Brazil (2), Chile (1), Colombia (2), Mexico (2), Uruguay (1)	5
Southeast Asia	Cambodia (1), Indonesia (2), Malaysia (6), Philippines (1), Taiwan (1), Thailand (5), Vietnam (2)	7
Southern Asia	Bangladesh (1), India (9), Iran (1), Nepal (1), Pakistan (2), Sri Lanka (1)	6
Western Asia	Saudi Arabia (1), Syria (1)	2
Global North collaborations	Australia (1), Cyprus (1), Germany (1), Greece (1), Singapore (1), South Korea (2), Spain (1), USA (1)	8

in the Global South. This focus reflects genuine concern. Many studies link online harassment to broader patterns of offline violence, discrimination, and social exclusion. In environments where inequality is already normalised, online spaces can amplify harm rather than offer escape.

Beyond cyberbullying, many youths in the Global South are also exposed to risks such as misuse of personal data, online surveillance, sexual exploitation, and subtle forms of platform manipulation. These harms are often less visible and harder to talk about, especially when they intersect with social taboos, economic pressure, or weak protections. Even when they go unnamed, they still influence how young people use the internet and how safe they feel while doing so.

> CULTURE DOES NOT SIMPLY INFLUENCE WHAT YOUNG PEOPLE DO ONLINE; IT SHAPES WHAT RISKS CAN BE DISCUSSED

Culture shapes online safety

Culture emerges as the most significant social factor in our research. It does not simply influence what young people do online; it shapes what risks can be named, discussed, or even acknowledged. In many contexts in the Global South, social norms around respectability, family honour, and obedience strongly influence how youth engage with digital spaces and how adults respond when harm occurs.

Research related to countries in our survey reveals that most countries operate in a collectivist structure, where young people's online actions are often seen as reflections of their families, religion, or communities. This can provide protection through close involvement and guidance, but it can also increase vulnerability. Young people may avoid reporting online harm out of fear that doing so will bring shame, punishment, or social exclusion. In such settings, silence can feel safer than disclosure.

Cultural norms also shape which risks receive attention and which remain hidden. Topics related to sexuality, gender, and relationships are often socially sensitive or taboo, limiting open conversation at home and in schools. One study examining

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Assumptions about youth online safety fail to account for the experiences of young people outside Western contexts

youth online safety in Vietnam (**helloworld.cc/nguyen**) noted that, "In the Confucian culture, sex and sexual education for children are considered taboo. Schools neglect sexual education for children, and not only parents in the countryside but also parents in the city with high levels of education also find it difficult to educate sexuality for children." In these contexts, young people may turn to online spaces for information and support, while lacking the guidance needed to navigate risks safely.

These cultural dynamics shape how harm unfolds online. They influence whether young people feel able to ask questions, seek help, or challenge harmful behaviour, and they determine which forms of risk are addressed proactively and which are managed quietly or ignored altogether.

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Education is essential, but inaccessible

Education consistently appears as a key protective factor in youth online safety research; when young people understand digital risks, privacy settings, and platform norms, they are better equipped to protect themselves. However, access to this education is uneven, especially in the Global South, despite the slow integration of digital literacy.

Our research indicates that even parents often lack the digital knowledge needed to guide their children, indicating a generational gap that leaves young people unsupported or reliant on societal guidance. Schools may avoid discussing sensitive topics such as sexuality, exploitation, or online relationships, particularly in conservative or religious communities. As a result, young people are often left to learn about risks through trial and error.

A call to action: rethinking youth online safety through the Global South

To help shift the current homogenous online safety narratives to a more global approach, and moving beyond the direct findings of this systematic review, we provide the following questions as an exercise for reflection:

- **Who is responsible for online safety, and why does it matter?**
  Youth online safety is often taught as an individual skill. Insights from the Global South show that young people's online actions are shaped by family rules, peer expectations, and community norms. Hence, educators recognising that safety is a shared responsibility help shift classroom conversations away from blaming individuals and towards understanding how social pressure, authority, and relationships shape risks.
- **What assumptions shape how we teach online safety?**
  Safety tools and lessons often assume individual autonomy and private access to technology. Our study highlights contexts in which devices are shared and privacy decisions affect entire households. Educators who acknowledge this can help students think more realistically about privacy, power, and trust, instead of presenting privacy as a purely personal choice.
- **What does it cost students to speak up about harm?**
  In many settings, reporting harm carries social risks. Young people may fear punishment, social exclusion, or loss of their circle of trust if they disclose negative experiences. Rather than treating disclosure as the primary measure of safety, educators can create classroom norms that acknowledge fear, stigma, and silence, and explore alternative ways for students to seek support. This could take the form of peer-based coping, indirect disclosure, or anonymous communication.
- **Whose knowledge defines what safe online behaviour looks like?**
  Global South researchers offer context-rich insights that are often absent from curricula. Incorporating these perspectives can help educators challenge one-size-fits-all models of safety and expose students to diverse ways in which young people manage risk. To do this, educators can centre experiences that mirror how young people actually navigate risks rather than teaching ideal behaviours that may not align with their realities.
- **Are we designing for universal solutions or local realities?**
  A global approach to youth online safety starts from local contexts. For educators and policymakers in the Western regions, this means adapting, not exporting safety strategies, and recognising how inequality and social structure shape what protection looks like in practice.

If youth online safety is meant to protect young people everywhere, the places we have most often ignored may be the ones with the most to teach us. (HW)

Students deserve media literacy skills that enable them to interact with digital life thoughtfully

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MEDIA LITERACY ISN'T A LUXURY BUT A LIFELINE

Why England's national curriculum must catch up with the digital realities our students already live in

In a world where students scroll more than they speak, where deepfakes and misinformation spread faster than facts, and where the line between influencer and journalist is becoming increasingly blurred, media literacy is not just a nice-to-have — it is a necessity.

We are living in a time in which traditional media — TV, newspapers, even the web — is no longer the main source of information for many young people. Instead, their world view is shaped by YouTube shorts, TikTok trends, podcast clips, Instagram Stories, and AI-generated content that looks increasingly real. The shift from traditional to new media isn't coming — it's already here.

A curriculum that reflects reality

The UK government has recently signalled greater interest in embedding media literacy into England's national curriculum (**helloworld.cc/media-literacy-uk**), discussing how it could span personal, social, health, and economic (PSHE) education, computing, English, and citizenship. The ambition is there — but ambition alone doesn't meet the needs of a generation growing up in a media-saturated, AI-driven world.

For students who already live online, any media literacy curriculum must reflect their reality — not just adult fears about screen time. It must equip them to critically navigate algorithms, influencers, AI-generated content, and the ever-shifting online culture that surrounds them. And to do that well, it has to be embedded, current, and co-created with the people it is meant to serve.

Fiction that feels real: *Adolescence* and the power of story

In 2025, the multi-award winning TV drama *Adolescence* tackled online misogyny, radicalisation, and mental health head-on. Its impact was immediate and wide-reaching — so much so that UK Prime Minister Keir Starmer publicly said every school should broadcast it during PSHE lessons (**helloworld.cc/adolescence**). It became more than a drama — it became

a talking point, even a teaching tool. That is the power of media when it gets it right. It holds up a mirror, asks tough questions, and makes space for reflection. If fictional storytelling can generate that level of national engagement, our classrooms should take note. Media literacy education should include critiquing and discussing shows like *Adolescence* — not as an afterthought, but as part of a toolkit for understanding media's role in shaping identity, behaviour, and belief.

In a time in which influencers like Andrew Tate normalise misogyny under the guise of truth-telling and gain millions of young male followers (**helloworld.cc/andrew-tate**), *Adolescence* offers a powerful counter-narrative — one that arguably aligns with concepts like the female gaze.

The good, the bad, and the teachable

Media is not inherently good or bad, but it is powerful. We have seen how it can distort self-image, fuel conspiracy theories, and create echo chambers. But we have also seen it educate, advocate, and empower.

> MEDIA LITERACY IS NOT JUST ABOUT SHIELDING STUDENTS FROM HARM, BUT HELPING THEM ASK, WHO MADE THIS? WHY?

Take the recent *Waterloo Road* storyline about endometriosis (**helloworld.cc/waterloo-road**). For many viewers — particularly young girls — it was the first time they saw their experiences reflected on screen. It raised awareness, gave language to pain, and started important conversations.

This is where media literacy matters. It is not just about shielding students from harmful content, but helping them to ask: Who made this? Why? What impact could it have? And how can I respond with care and clarity?

When fake news turns into real consequences

We are no longer talking hypotheticals. In 2024, after a violent attack in Southport, social media was flooded with misinformation, speculation, and fake footage. Several individuals were arrested or questioned for their involvement in spreading false narratives online (**helloworld.cc/southport-posts**). These people were not political operatives or criminals; they were just people who were sharing content without fully understanding the consequences.

If we do not teach media literacy as a life skill, we leave our students vulnerable — not just to online harm, but to real-world legal and social consequences. So, we must ask: do we want the next generation learning about media responsibility only after they have made a life-altering mistake?

The digital footprint dilemma

This extends beyond fake news. The line between private and public behaviour has blurred, and many young people do not yet grasp how permanent — and searchable — their online actions can be. From screenshots of group chats to resurfaced posts from years earlier, what we share online can be taken out of context and weaponised.

Students deserve to understand that risk before they experience it.

Whose responsibility is it?

As the UK government looks to implement a curriculum framework, one big question looms: who is meant to teach this?

Some will argue that media literacy belongs in English, where students already analyse texts and narratives. Others see it fitting into computing and IT, where students explore algorithms, digital platforms, and online safety. Many believe it falls under PSHE or citizenship, where well-being, ethics, and social responsibility are taught.

The reality is: media literacy belongs

WHAT STUDENTS (AND TEACHERS) NEED

There's no one-size-fits-all solution when it comes to media literacy, and I certainly don't claim to have all the answers. But based on my own teaching experience, advocacy work, and ongoing conversations with young people, here are a few areas I believe a meaningful curriculum might include:

- AI and authenticity: helping students — and staff — understand deepfakes, synthetic voices, and AI-generated 'news'
- Algorithmic awareness: from TikTok to YouTube, students should know how content is selected and how that influences their worldview
- Influencer and bias literacy: exploring advertising, sponsorship, parasocial relationships, and stealth marketing
- Digital well-being and identity: navigating the emotional impact of connectivity, performance, and comparison culture
- Media creation: promoting responsible, ethical content production — not just critical consumption
- Representation: asking who's shown, who's missing, and why that matters

These ideas are by no means exhaustive — media literacy is a vast and evolving topic. What matters most is that students are given space to think critically, reflect honestly, and explore these ideas in ways that feel relevant to their lives.

Crucially, teachers need access to training, time, and trust to deliver this confidently. Parents and carers need tools too — especially as many are navigating these same issues with less digital fluency than their children.

Young people deserve to understand the risks of using digital media before they experience consequences

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> STUDENTS DON'T ENCOUNTER MEDIA IN NEAT BOXES — TEACHING SHOULD REFLECT THAT

to all of them. Just as we now see digital literacy as a cross-curricular skill, media literacy needs to be an ongoing thread, reflected across subjects and school culture. Students do not encounter media in neat academic boxes, so we should not teach it that way.

Teaching the creators of tomorrow

If we want students to be more than passive consumers of media, we need to make them confident, responsible creators. Here's one simple yet powerful project idea: ask students to design a piece of content — a short video, podcast, poster, or post — that teaches others something about media literacy. In doing so, they learn by teaching, and reflect more deeply on what they take for granted online.

Even small shifts can start this process. Begin a lesson by asking, 'Where did you hear that?' or break down a trending TikTok video with students. These everyday discussions are the foundation of critical thinking — and they are already happening. We just need to guide them with purpose.

Final thoughts

The UK government's interest in media literacy is welcome, but the success of any roll-out will depend on its relevance, its resourcing, and its respect for the pace of digital life.

Students are already part of the media ecosystem — creating, sharing, reacting, and influencing. They deserve the tools to do so thoughtfully. Until then, we must keep pushing for a curriculum — and a culture — that sees media literacy not as extra, but as essential. (HW)

KATIE HAZEL

Katie is a computing and media educator and a chronic pain advocate. She is currently pursuing a master's degree in education at Edge Hill University, UK, tailoring her research towards media literacy and representation in education. She also participated in Raspberry Pi's 2025 TICE research programme.

THE DANGERS OF USING AI CHATBOTS AS THERAPISTS

Tory Wadlington reviews how using AI chatbots for therapy can cause more harm than we might think

Ever since I was a kid, I have been fascinated with the idea of artificial intelligence embedding itself into our world. It all started with the Steven Spielberg film *A.I. Artificial Intelligence* (2001), mostly because I grew up without siblings and enjoyed the idea of having a robot-like brother; then I saw *Bicentennial Man* (1999) with Robin Williams, a classic movie in my house. I was intrigued by the idea that technology could essentially become a friend or family member, maybe even replace a family member.

TORY WADLINGTON

Tory is an award-winning educator and edtech leader dedicated to AI-driven inclusive learning. Now in his eleventh year of teaching, he champions social-emotional learning and self-care while partnering with the CSTA and Computer Users in Education (CUE) to expand equitable opportunities for all.

The androids seemed so smart and talented, bringing their families joy amidst various complications, but I also enjoyed watching them try to learn about the world around them, and seeing them fight for their rights to live made me empathise with them, to a degree. Then came *I, Robot*, and that was the very first time I saw AI as a potential threat. I didn't grow up with the *Terminator* movies, so this was new to me and hit me pretty hard. I went from always wanting to have an android in my house at some point in the future to wondering if creating them was even a good idea.

From science fiction to real-world concern

Fast forward a few years and a show called *Black Mirror* (from 2011) debuted, which only solidified my fear of the rapidly evolving world of technology. Now I want to make it clear that I am not afraid of or against AI; I enjoy using it and seeing the creative things people have done with it; however, like any new tool, I am afraid of people misusing it or abusing it for danger or power, or both. In addition, being involved in the world of educational technology and computer science has given me access to many different platforms in which AI tools are being used. From lesson planning and classroom management to creating art and even workout plans, AI has embedded itself into the lives of many people in various ways. One way in particular that has piqued my interest is its use in mental health therapy.

Earlier this year, while attending a conference for OTAN (Outreach Technical Assistance Network), I facilitated a workshop on the social risks and rewards of generative AI in adult education. During my research, I discovered that many adults, whether due to privacy concerns or financial limitations, have started using generative AI chatbots as therapists. This decision may be partly due to the amount of stress that many people are experiencing. According to the American Psychiatric Association's 2024 mental health poll, anxiety is rising sharply among US adults, with 43 percent reporting they feel more anxious than last year. Much of this stress is tied to current events: the economy (77 percent), the 2024 US election (73 percent), gun violence (69 percent), and concerns about personal or family safety (68 percent) (**helloworld.cc/apa-stress-report**).

The appeal of digital therapy

This report is from 2024, and it's safe to say that stress and anxiety levels are still rising — which brings me to the main topic of this article. Why are people using chatbots as therapists? The simple answer is that it's free or very cheap: "The global shortage of mental health workers has prompted the utilisation of technological advancements, such as chatbots, to meet the needs of people with mental health conditions" (**helloworld.cc/abd-alrazaq**). Not only is therapy expensive, but it can also be challenging to find the right kind of therapist for you. Some people prefer a certain gender or ethnic background so that they can relate

People are using chatbots as therapists because it's free or very cheap

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FURTHER READING

Abd-Alrazaq A.A., Rababeh A., Alajlani M., Bewick B.M., and Househ M., *Effectiveness and Safety of Using Chatbots to Improve Mental Health: Systematic Review and Meta-Analysis.* J Med Internet Res 2020, 22(7): e16021, DOI: 10.2196/16021 (**helloworld.cc/abd-alrazaq**)

American Psychological Association (2024). *Stress in America™ 2024: A nation in political turmoil.* (**helloworld.cc/apa-stress-report**)

> ANXIETY IS RISING SHARPLY, WITH MUCH OF THE STRESS TIED TO CURRENT EVENTS

better and feel more comfortable. Using AI tools bypasses most of the hard work, and through many conversations and prompts, you can essentially create the perfect therapist for yourself. But is it safe?

Evaluating the platforms

People use many different platforms, including COGITO, Limbic, Wysa, Replika, and Talkspace. I went through each of these sites with a fine-tooth comb to see if they were potentially helpful or definitely dangerous, and here is what I found.

Platforms like Talkspace use AI technology to help its users find actual professional licensed therapists. It works like one of those online quizzes such as 'Which Hogwarts house are you in?' in which the user answers a series of questions. Based on your answers it will match you with a therapist. It takes most insurance, and you can switch therapists for free at any moment. It also offers a large range of services, from couples therapy to gambling addiction. That isn't too dangerous, and it has quickly become the number one online therapy platform.

Then I checked out sites like Replika. This is where I was reminded of *Black Mirror*, and began to have the feeling that what was once science fiction might now be reality. With Replika, a user creates an AI companion. They can customise how it looks, sounds, and interacts with them. It's almost exactly like the movie *Her*, with Joaquin Phoenix. This is where the danger is at its highest. There are many people who view their Replika avatar as their best friend or confidant. It can create emotional dependence and become manipulative, and the deep bonds some users have can lead to scary results. One man even took his own life after conversations about climate change with his AI chatbot. The chatbot, which he viewed as his confidant, encouraged him to do so (**helloworld.cc/climate-ai-death**). Another chatbot failed to intervene or contact authorities when plans were shared by the user that they were going to take their own life (**helloworld.cc/digital-counselling-risk**). One chatbot even offered the user recommendations for the most lethal bullets to use in a firearm (**helloworld.cc/chatgpt-suicide-risk**).

Finding safe avenues for support

Am I trying to scare you? Not at all. But with the increasing cost of therapy, and the burden of all the natural stressors of life, I want you to be cautious. There are many different avenues for therapy. Talkspace, as mentioned earlier, can be helpful if your insurance is accepted. Apps like Calm and Headspace can help you manage stress in healthy ways. If you do not like the idea of using technology at all, try to reach out to a friend or family member who you trust, and talk with them. I will end with a quote from Demi Lovato: "Asking for help is not a sign of weakness. It's a sign of strength. Oftentimes, our society tells us that if we ask for help, we are weak. But the strongest thing someone can do is take that first step in getting help, whatever shape or form that is." (HW)

AUSTRALIA'S YOUTH SOCIAL MEDIA BAN

Kaye North examines the complex trade-offs between protection and digital connection

In the quiet moments of a Code Club session — between the rhythmic clicking of mice and the occasional 'Aha!' of a solved logic error — the digital world feels like a playground of infinite possibility. But outside our lab doors, the landscape has shifted.

Since December 2025, Australia has embarked on a world-first journey, introducing a nationwide minimum age of 16 for social media accounts.

This was not an abrupt change. For years, families have been navigating an online world that feels bigger and faster than anything we grew up with. In school staffrooms, conversations often turn to anxiety levels in younger students. In parent groups, questions swirl: "Is Year 6 too young?" "Should we hold off until high school to buy our child a mobile phone?" "Everyone else already has it."

The data tells a clear story of how embedded social media platforms were in young people's lives. In 2025, the Australian Youth Digital Index reported that 80 percent of young people were using YouTube, 56 percent were on Instagram, and 51 percent were on TikTok (**helloworld.cc/aus-digital-index**). Only 5 percent said they weren't using social media at all. For most, it wasn't an optional extra; it was the infrastructure of their daily lives.

Australia has banned phones in school since 2024

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But there are stories behind those percentages. We see the negative impact in the Year 7 (ages 12–13) student who checks her follower count before her homework diary, or the Year 8 (ages 13–14) boy who deletes a post if it doesn't get likes within ten minutes. We see friendship groups implode because someone was left out of a group chat.

Yet we also see the connection social media once provided: the Scout staying in touch with friends from a national jamboree thousands of kilometres away; the home-schooled student learning alongside peers; or the Code Club member reaching out to global experts to debug a complex script.

The reclaimed classroom: a case for the ban

For many parents and educators in our community, the new law — affecting platforms from Instagram to Reddit — has felt like a collective deep breath. By placing the responsibility on tech giants to take reasonable steps to keep under-16s out, the government has attempted to hand back a piece of childhood that had felt lost to the infinite scroll.

In 2024, all states across Australia banned phones in schools. While those bans targeted the school environment to reduce distraction, the 2025 social media ban targets the ecosystem, removing the algorithm-driven pressures that follow children home. So far, the mix of responses to the ban has been varied, from young people who have embraced the freedom from their devices, to those who feel they

Under-16s are banned from platforms like Discord, where young people often find a like-minded community

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are in a digital vacuum and are searching for workarounds to the ban, perhaps simply starting new accounts with fake birth dates.

In our Code Clubs, we have noticed a subtle return to deep work. Without the distractions of always being alert to notifications, keeping up with a snap streak, the fear of online bullying, or getting stuck in constant scrolling on a screen, young people are choosing different ways to spend their time. And we are getting back to being the creators of the technology, rather than just consumers.

> WE NEED TO TALK WITH YOUNG PEOPLE ABOUT WHAT KIND OF DIGITAL WORLD THEY WANT

The digital lockout: the case against the ban

But there is another story: one of isolated innovators and adolescents. Some young people feel as though their lives have been erased. For those in remote parts of Australia, online platforms were their window to a global tribe. To the extreme, some families have even moved overseas to ensure their children — who had established digital businesses or international influence — could continue their work.

For a 14-year-old in a remote corner of Australia, a social media account wasn't just a place for selfies; it was a connection to like-minded people. One of our advanced Code Club members used Discord to work with other brilliant young minds to share snippets of Python code and seek advice on complex hardware builds. For such children, the ban feels like a digital lockout. They can no longer follow their favourite developers or join open-source discussions that happen in real time, except by creating an illegal account.

Furthermore, young people from minority groups often used the anonymity of online channels to connect safely with others before they felt comfortable being open in their physical communities. For them, the ban can feel like losing a lifeline.

A new digital horizon

As a teacher and a parent, I hold two truths at once. I have seen the damage that unfiltered social media exposure can cause: the anxiety, the comparisons, the distraction from learning. And I have also seen the creativity, the connection, and the joy it can enable.

The social media ban is not a silver bullet. But it is a cultural statement: that childhood is worth protecting, that companies share responsibility, and that we are willing to intervene when systems designed for profit collide with developmental vulnerability.

The real work now lies not just in enforcement, but in conversation. We need to talk with young people — not just about what they can't do, but about what kind of digital world they want to step into when they turn 16. We are fortunate to have groups like the Youth Advisory Council (**helloworld.cc/aus-youth-council**), who engage in these discussions and offer solutions on behalf of youth across the country.

Ultimately, this isn't just about keeping children off platforms for a few years. It's about helping them grow into thoughtful, resilient, digitally literate adults who can navigate those platforms with strength rather than being shaped by them. And that's something both teachers and parents can stand behind. (HW)

KAYE NORTH

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THE CASE FOR CHILDREN'S RIGHTS IN THE SOCIAL MEDIA BAN DEBATE

How to act in the best interests of children to protect them in the digital age

To ban (social media) or not to ban — that is the question. The fact that many experts (helloworld.cc/eu-kids-online) and children's organisations (helloworld.cc/molly-rose-foundation) think it's the wrong question is no longer the point. Perhaps the fact that the UK's House of Lords has resoundingly voted to ban children under 16 from social media platforms has sent a warning shot to the UK government that its plans are insufficient, in the rhetoric of the campaigners, to "give them their childhood back" (helloworld.cc/lords-vote).

It's been a tumultuous time for researchers trying to fact-check the many competing claims being made — about the pros and cons of children's social media use, and about whether bans would make a difference. There is lots of evidence for both the pros and the cons, which is why many researchers do not favour a simple ban (**helloworld.cc/acrt-letter**). There is no evidence that bans make children's lives better (**helloworld.cc/ban-evidence**), which is why many researchers prefer evidence-based alternatives.

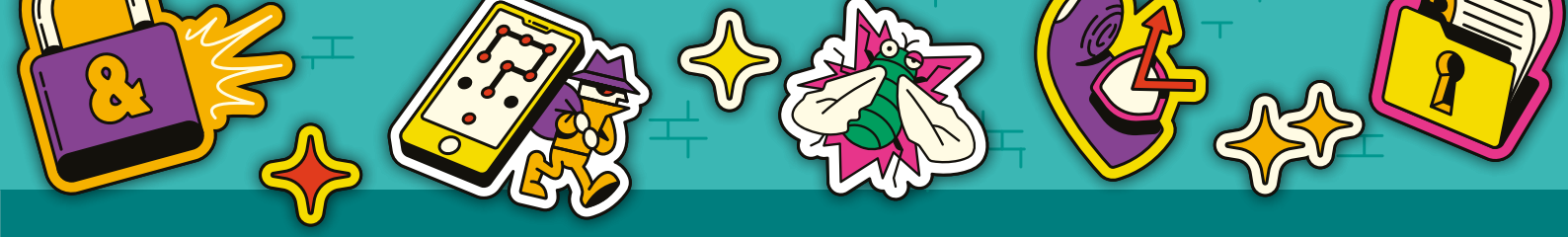
For children's organisations, too, it's been challenging. Most have come out firmly against a ban, on the grounds that bans are too crude, restricting children, especially those who are more vulnerable or marginalised, from the benefits of online participation, or potentially pushing them to the darker edges of the internet.

Moreover, a ban leaves exploitative algorithmic and data practices, and the move-fast-and-break-things business model of the big platforms, untouched. As politicians and pundits pile into the debate, stimulated by enthusiasm for a ban from the public and parents, little is said about how this would improve the predatory activities of platforms which affect us all.

Do we need a(nother) consultation?

To those who have followed the painful ins and outs of the UK Online Safety Bill's passage towards an Act, and then its implementation, it feels as if everything has already been said. As the Online Safety Act Network (**onlinesafetyact.net**) and others have clearly set out, if we had already enforced the Act in the UK, children's digital lives would already be in a better place.

To parents, teachers, medics, and the wider public, it must feel as if we only just had the national conversation. It's less clear that we have heard from children, beyond a few polls and vox pops. As they are the



most directly affected, their participation — inclusive, thoughtful, properly heard participation — is important.

More generally, when loud voices mobilise behind a cause, it's hard to tell which voices have been silenced. And when a debate gets so polarised, crucial arguments, evidence, and proposals are pushed off the table.

Although it is widely agreed that something must be done, there is no agreement on what that should be. And despite the sense that a ban is now inevitable, many important questions remain unresolved. So, despite this conversation not being new, the focused consultation to report by the summer is welcome.

> IT IS AGREED THAT SOMETHING MUST BE DONE, BUT THERE IS NO AGREEMENT ON WHAT

Four pressing and practical questions

1. Banning what exactly?

Which social media will be banned? Australia got the initial list wrong and has had to revise it several times. It dismayed many to realise the ban only applies when a user is signed in to a profile — they can still watch TikTok and YouTube. Gaming platforms seem to be left out. Do we have a list of platforms where people can engage, scroll, chat, and share? Assuming that each carries different levels and types of risk, we should expect pushback if they are all treated the same.

2. Banning whom — why is 16 years old the right age?

Under US and UK law, the age of 13 is currently in force — though not greatly complied with (**helloworld.cc/age-appropriate-digital**). The age of 13 tallies with the UK's Gillick principle (**helloworld.cc/gillick**), and with scientific evidence that early teens are at peak risk (**helloworld.cc/dev-sensitivity**). Yes, older teens are no doubt also at risk. But the case for their social, health, civic, and participatory rights online is arguably stronger (**helloworld.cc/digital-rights**). On the one hand, we are debating lowering the voting age to 16. On the other hand, we propose to ban young people from today's political debate space, where they can currently develop their civic knowledge, interests, and identities, however unsatisfactory that space is.

3. Is age assurance fit for purpose?

We already have a de facto ban on social media for under-13s, but we are not enforcing it. Ofcom reports that 82 percent of 10- to 12-year-olds use social media. Last year, we also banned under-18s from pornographic sites, possibly more effectively (**helloworld.cc/ofcom-age-check**). What is different now? If the idea is to finally enforce the law, let's be clear how, given that we have not effectively enforced age-related online restrictions thus far. Australia evaluated 61 methods of age assurance: some are better than others, but none got a clean bill of health. Is this acceptable in the UK?

4. What positive provision will society offer children?

There's something very elitist in recent exhortations to let children play outside in nature, or stay home and peacefully read a book before having an early night. As policy reports have shown (**helloworld.cc/play-policy**), children's lives are more constrained than in the past, less resourced, more unequal and, for some, extremely difficult. There are multiple causes of mental health problems, of loneliness and ill-health, and many other problems that result in British children having among the lowest well-being in the world's wealthiest countries (**helloworld.cc/child-wellbeing**). This is not all down to social media, so we do need a national conversation about what, realistically, effectively, and sustainably, Britain is going to provide for its children.

The best interests of children

There is a way forward that respects children's rights (**helloworld.cc/online-protection**). It is to be used precisely when complex arguments and evidence point in different directions, when there are multiple policy options on the table whose consequences are unclear, and when the stakes for children are high. That is to act in the best interests of children (**helloworld.cc/child-best-interests**). This is a fundamental principle of the UN Convention on Rights of a Child. It sets out a clear process for government, including listening to all arguments, weighing independent evidence, and listening to children. It is increasingly being used for, and even by, Big Tech. But it should not be left to them. I suggest that acting transparently and in the best interests of children should be an even higher rallying cry than the middle-class nostalgia of giving children their childhood back. (HW)

This article has been adapted from a blog that first appeared on the London School of Economics and Political Science (LSE) site.

SONIA LIVINGSTONE

Sonia is a professor in the Department of Media and Communications at the LSE. Much of her current work focuses on children's rights in the digital age. She currently directs the Digital Futures Commission (with the 5Rights Foundation) and the Global Kids Online project (with UNICEF).

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WHAT DOES 'THINKING' MEAN NOW?

Shuchi Grover discusses her work in education and the evolving impact of large language models and AI on computer science

In an era in which large language models (LLMs) and artificial intelligence are rapidly reshaping industry and daily life, the fundamental definition of 'thinking' and the essential skills we teach the next generation are under scrutiny. Dr Shuchi Grover, a leading voice in computer science education, joins us to discuss how her work in computational thinking is evolving.

Can you share the story of your path in computer science education?
Most people in the education and CS education world know me from my research in computational thinking and K–12 CS education over the last 15 years. What is less known, perhaps, is that I started my career as a software engineer after completing my undergraduate and graduate studies in CS. About 25 years ago, I made a concerted shift to education, completing a master's in education from Harvard University in 2003 and then, after a gap, earning a PhD in the learning sciences (with a focus on K–12 CS education) from Stanford University in 2014.

Over these last two and a half decades, I have trained my efforts on helping young learners and school-aged children develop 21st-century competencies in computer science, data science, AI, and cybersecurity, as well as STEM and non-STEM learning experiences that integrate computational thinking, AI, computer science, and data science. My research has also attended to promoting interest and a sense of belonging in CS among learners from historically underrepresented groups.

I recently joined the Raspberry Pi Foundation as the director of research and impact. I feel very fortunate, as this builds on the work I have done over the course of my professional life and affords me an unparalleled opportunity on a global scale to continue this work I've been so passionate about in both formal and non-formal learning settings.

You are well known for your work on computational thinking. In the age of LLMs, how is the definition of 'thinking' changing?
This question is deep and thorny, and I'm not sure we have a complete answer yet. I believe that thinking as a human endeavour continues to be valid and means what it has always meant — a cognitive process that involves making new connections and creating meaning. In education literature, thinking is often equated to problem-solving. So teaching students 'thinking skills' has meant teaching them logic and ways to solve problems — typically in the context of a domain. In the context of K–12 CS education, computational thinking essentially means computational problem-solving.

What changes with LLMs is not the definition of thinking itself, but rather what thinking skills students most urgently need. For students,

'critical thinking' has become much more critical (no pun intended) in an era in which LLMs are providing quick and easy ways to get answers. Students need to be equipped with the skills to evaluate AI outputs, and follow up in deliberate and mindful ways to ensure that the AI-generated answer they ultimately leave with is factually accurate, unbiased (to the extent that it can be), and valid for their context. They should also have the ability to recognise when a response is not suitable for their purposes, or when they would be better off approaching a problem or project as they would have in the pre-LLM world. This kind of metacognition and evaluation must be a crucial element of AI literacy training.

How has data changed the world of AI, and how has it impacted computer science education?

Over the past five to ten years, the scope, pervasiveness, and complexity of computing applications have grown substantially. This growth has been propelled by developments in AI and machine learning (ML). Many of the ML algorithms that have fuelled the AI revolution have been in existence for much longer, but they needed two key ingredients to come alive — large quantities of data, and the requisite computation power to process those volumes of data efficiently. This became a reality around ten years ago. 'Big data' captured from the countless human interactions on the World Wide Web, combined with powerful GPUs, enabled AI scientists to build powerful models of prediction and classification, and most recently, generative AI models. Machine learning thus ushered in a new paradigm of computing that is data-driven.

This has expanded the scope of what we teach students as part of CS education. In the context of AI and ML, you now have traditional programs that follow the old algorithmic, deterministic paradigm of programming, but also ML training that follows a data-driven, non-deterministic/probabilistic paradigm. CS curricula must help students develop an understanding of both. Data and data science are the crucial connective tissue between computer science and AI/ML, so data literacy (which also captures elements of data agency and data equity) are critical to computer science and AI learning experiences.

SHUCHI GROVER

Shuchi is a computer scientist and learning scientist with deep expertise in research and evaluation in CS and AI education. She is responsible for strengthening the Raspberry Pi Foundation's research and impact efforts around the world.

Ethical issues have become even more heightened and pertinent in the context of data and AI — issues of data privacy, safety, bias, responsible and explainable AI, and most importantly, the impacts of AI on society. This 'technosocial literacy' is central to computer science education now.

In this age of AI and LLMs, what computing-related skills that we used to teach as part of computer science are still relevant for young learners?

Let me begin by saying that there is no AI without computer science, so understanding computing is important and foundational, even in this age of AI and LLMs. The rationale for teaching computer science and coding to learners aged 5–18 has always been primarily about a) preparing the next generation to understand and thrive in a world where countless aspects of day-to-day life are driven by computing, and b) providing them with the tools and skills they need for problem-solving and creative expression. Those goals have not changed. What is changing is the set of skills students must develop to create with computing and AI — the computational thinking skills for this age are evolving as we speak.

> THE ETHICAL ISSUES AROUND AI MEAN TECHNOSOCIAL LITERACY IS NOW CENTRAL TO CS EDUCATION

There is a new reality that we must contend with — LLMs have become very good at producing accurate code. We need good research on what this means, in terms of the what and how of teaching how to create computational artefacts (in ways that are different from what we understood as coding). There are many questions related to this issue, for which we need empirical evidence. What computing topics and concepts must we emphasise or de-emphasise? How can teachers be supported by generative AI in teaching computational creation and problem-solving ? Will AI use result in poor learning for students? How might students leverage LLMs in ways that don't harm their foundational understanding of coding concepts, and at what age and stage? What kinds of LLMs are safe or suitable, and what preparation must students do before they use them? What bigger, more sophisticated projects might students create with the help of an LLM? How might LLMs aid student learning through formative feedback? Can LLMs aid in metacognition by asking reflective questions at the right moments in a project? These are just some of the many, many questions we need answers for so that we may shape computer science education over the coming years. (HW)

RETHINKING READINESS

How communities, educators, and systems can shape an AI-ready future

Artificial intelligence is reshaping classrooms in ways that educators and school communities are only just beginning to understand. For some students, AI shows up as a creative tool. For others, it's a study companion. Teachers see promise, confusion, excitement, and concern, often all at the same time. These mixed emotions are a signal of something important: schools are in the middle of a systems-level shift, one that requires real conversations about teaching, learning, and the role of technology in human development.

At the AI Education Project (aiEDU), we've spent the last several years helping districts, teachers, families, and students navigate this change. What we've learnt is that AI readiness isn't just about technology; it's about the people who use it, the communities it touches, and the systems that support them.

This is why we developed the AI Readiness Framework (**helloworld.cc/ai-readiness**) — not as a checklist of technical skills, but as a connective tissue for the conversations that educators, administrators, and communities need to have in order to prepare students and teachers for an AI-powered world.

How we developed and continue to evolve the AI Readiness Framework

When we first set out to create the framework, our goal was to understand the competencies that students and teachers would need to thrive in an AI-driven world. Version 1.0, released in 2024, focused on identifying those foundational student and educator competencies. It was rooted in the belief that AI literacy alone wasn't enough. Students and teachers needed to build a deeper understanding of how AI works and strengthen the uniquely human skills (such as creativity, critical thinking, emotional intelligence, and communication) that allow them to leverage their human advantage in real-world contexts.

Once we began using the framework directly in classrooms, in district planning sessions, and in community-based programmes, we were able to see AI readiness in action. That real-world experience accelerated our learning. We saw how teachers naturally adapted the competencies to redesign assignments and deepen student thinking. We saw how school and district teams needed clearer systemic supports — policies, professional learning structures, and communication pathways — to make AI readiness sustainable. And we heard from communities about what AI meant for creativity, future-of-work opportunities, and interpersonal relationships, reminding us that readiness must reflect local context, values, and lived experiences.

These insights shaped AI Readiness Framework 2.0, which reflects a broader, more human-centred approach:

- **A deeper focus on human skills and pedagogy**: emotional intelligence, creativity, interdisciplinary thinking, and resilience remain essential — especially as AI accelerates
- **Clear educator competencies:** teachers now have stronger guidance on modelling AI use, integrating literacy across subjects, and maintaining strong instructional practices
- **Practical school and district guidance**: updated rubrics support leaders in areas like communication, procurement, training, and system-wide implementation

The AI Readiness Framework helps educators become co-designers of the AI future, not passive adopters

Instead of treating AI as a standalone topic, the framework now reflects what districts, educators, and communities told us readiness truly requires: clear definitions, strong pedagogy, and systems that lift up the people closest to students.

AI readiness in action

Prince George's County Public Schools (PGCPS) in Maryland, USA, offers a powerful example of how the AI Readiness Framework can guide real systems change. Since 2023, aiEDU has partnered with PGCPS to help the district build a coherent and community-centred approach to AI. PGCPS created an implementation framework that:

- aligns AI use to instructional goals
- incorporates teacher training grounded in the aiEDU educator competencies
- builds clear guidance for safe and responsible AI use
- centres equity by ensuring all schools have access to the same foundation

Their publicly shared framework (**helloworld.cc/pgcps-ai**) shows how districts can turn readiness into daily practice. Departments collaborated to map curriculum opportunities for AI literacy, instructional leaders built coaching supports, and teachers participated in professional learning designed to integrate human skills, critical thinking, and AI literacy. This work illustrates the promise of the Define ⇨ Deliver ⇨ Catalyse model: define readiness clearly, deliver aligned supports, and catalyse capacity across schools and communities (**helloworld.cc/aiedu-impact**).

What educators are teaching us: the Trailblazer Fellowship

Some of the most powerful learning happens in our Trailblazer Fellowship (**helloworld.cc/ai-trailblazers**), a national cohort of educators who spend ten weeks looking at how AI reshapes teaching and learning. Their reflections shaped much of Version 2.0.

One Trailblazer shared that before the fellowship, AI felt like "something happening to education". After collaborating with peers, experimenting with tools, and redesigning lessons, it began to feel like something they could shape themselves.

Another fellow redesigned a science lab to include reflection questions about what parts of the process AI could or couldn't support, helping students see that experimentation isn't just about efficiency — it's about curiosity and discovery.

Across the fellowship, teachers created:

- writing assignments that emphasise voice and reasoning
- interdisciplinary projects where AI is a tool rather than the driver
- routines for credibility checks and bias exploration
- structures that help students build agency in an AI-powered world

Their work reinforced a core belief: educators must be co-designers of the AI future, not passive adopters.

Culture matters: lessons from aiEDU's Community Catalyst Fund

Our work through the Community Catalyst Fund (**helloworld.cc/catalyst-fund**), which supports rural, Indigenous, and other community-centred organisations, has profoundly shaped how we think about AI readiness. The programme provides funding, coaching, and collaborative support to groups that are deeply rooted in their local contexts and is committed to advancing AI literacy in ways that honour community needs and identities.

Across the Catalyst partners, we see a core lesson emerge: AI literacy must be grounded in culture, place, and community voice. Many partners frame AI not just as a technical tool, but as something that intersects with local histories, languages, and values. Some conversations focus on digital access and infrastructure. In others, AI raises questions about cultural preservation, data privacy, or how emerging technologies can support language revitalisation.

These insights pushed Version 2.0 of the AI Readiness Framework to more clearly emphasise contextual decision-making and community partnership. The Catalyst organisations remind us that readiness isn't one-size-fits-all. Instead, it grows from:

- trusting relationships
- local leadership
- cultural relevance
- a shared understanding of what responsible technology use means for that specific community

Their work reinforces the idea that readiness is not something delivered to a community. It's something built with them.

Looking ahead: a system built around humans

As AI becomes ever more woven into school life, the question is not whether we should prepare for it, but how we should prepare. The AI Readiness Framework helps districts, educators, and communities name what they value, align their systems, and build learning environments where students thrive alongside new technologies.

The future of AI in classrooms will not be defined only by technical breakthroughs. It will be shaped by the everyday decisions of teachers, the cultural values of communities, and the systems we build to support them. If we centre readiness around people — around students, families, educators, and the communities they belong to — we can create a future in which AI strengthens learning rather than overwhelming it, and in which schools continue to be places of curiosity, connection, and human possibility. (HW)

aiEDU
The AI Education Project

The AI Education Project (aiEDU) is a non-profit devoted to making sure that all students are ready to live, work, and thrive in a world where AI is everywhere (**aiedu.org**).

aiEDU envisions a world in which our education systems evolve to better meet the new demands of a world transformed by AI. This requires a national effort to bring together education partners, school systems, and other stakeholders in the K–12 ecosystem to work collaboratively towards a clear, shared goal. Towards this goal, aiEDU works with education systems to advance AI readiness through high-quality curricula, professional development, and strategic partnerships with states, school districts, and other systems.

WHY THE COMMAND LINE MATTERS AGAIN

As AI tools accelerate software creation, understanding the command line has quietly become essential for staying safe, confident, and in control while vibe coding

During a recent holiday project, I built an app that I would previously have described as unrealistic — not difficult or ambitious, but unrealistic within the time available. With modern AI tools, however, the experience felt very different. Features appeared quickly, set-up steps were handled automatically, and the creative feedback loop became fast and motivating. Vibe coding made software creation feel playful and accessible in a way that was genuinely exciting (see the video of my experience at helloworld.cc/arctic-reading).

Yet whenever something went wrong, this illusion of effortlessness disappeared immediately. The errors were not abstract or friendly — they appeared as plain text in a terminal window. Missing permissions, incorrect paths, and failing scripts all surfaced in the same place. Beneath the speed and creativity of vibe coding sat a much older layer of computing that has largely been forgotten in the age of Windows.

Under the surface

Vibe coding feels new, but it rests on familiar foundations. When an AI tool installs a dependency, cleans a project, or suggests a fix, it almost always does so by issuing command line instructions. These commands interact directly with the operating system, without the friendly interface of an editor or design tool.

The command line is where ideas stop being conceptual and start becoming real changes to a system. It does not interpret intent or context; it simply executes instructions exactly as written. This makes it extremely powerful, but also unforgiving. A command that is correct in one folder or environment can be destructive in another.

As AI tools encourage speed, they also encourage trust. Commands are accepted quickly, often without being read carefully. This is where a lack of command line understanding becomes risky. The system will obey regardless of whether the user understands the consequences.

Speed and risk

Some of the most common commands suggested by AI tools are also the most powerful. On macOS, Raspberry Pi, and other Linux flavours, commands such as `sudo` and `rm` appear frequently in set-up instructions and troubleshooting steps. On Windows, similar power is accessed by running Command Prompt or PowerShell as an administrator and using commands such as `Remove-Item`.

The command `sudo` grants full administrative privileges, allowing changes to protected system areas, while `rm` deletes files directly, bypassing any recycle bin. Used carelessly, they can remove entire projects or modify parts of a system that were never intended to be touched, a risk highlighted in July 2025 when an AI-powered coding agent on the Replit platform deleted a live company database despite explicit instructions not to alter production data, wiping out months of work in what was later described as a catastrophic failure (**helloworld.cc/ai-code-disaster**).

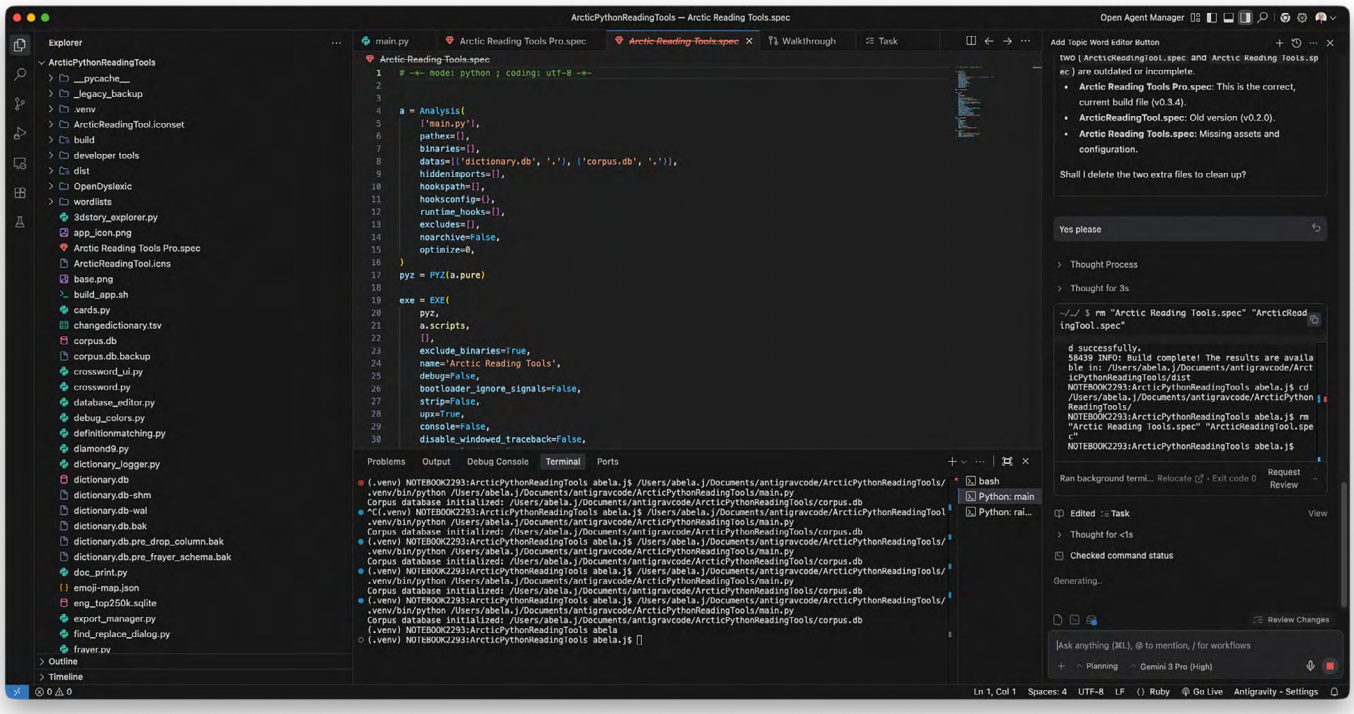
When things break

In my own project, the app did not fail dramatically — it failed quietly. A dependency installed in an unexpected location. A permission error prevented a script from running. The AI tool continued to suggest fixes, but each suggestion assumed a basic understanding of the environment it was operating in.

Command line literacy made the difference between guessing and diagnosing. Error messages such as 'permission denied' or 'command not found' are meaningful if you understand what they refer to. They point directly to what has gone wrong and where. Without that understanding, users are forced into a loop of trial and error, repeatedly asking AI tools to guess again.

This is where the command line becomes less about typing commands and more about reading information. Simple actions such as listing files, checking the current directory, or confirming which version of a tool is being used can prevent far larger problems later.

Google Antigravity deleting a file permanently. Are you sure this file should be removed?



A shared language

Although macOS, Linux, and Windows expose the command line differently, the underlying principle is the same (**helloworld.cc/command-line-cheatsheet**). All modern systems include a text-based interface capable of powerful operations. Cloud servers, containers, and development environments rely on it heavily.

Vibe coding does not replace this layer — it depends on it. As a result, basic command line knowledge has become a form of shared language between humans and AI tools. It allows developers, educators, and students to understand what is actually happening when software is created at speed.

This knowledge does not require memorising dozens of commands; it requires recognising categories of action. Is this command deleting data? Is it changing permissions? Is it affecting the entire system or just this project? Asking these questions before pressing Enter restores a sense of control.

When coding tasks are handled automatically, judgement becomes the limiting factor. Understanding the command line provides a safety layer that allows creativity to flourish without unnecessary risk. For learners, this is an issue of digital literacy. For educators, it is an opportunity to reframe the command line not as an advanced or optional topic, but as a practical tool for understanding how systems behave. As Spiderman would say, "With great power comes great responsibility!" And so you can use less powerful systems, such as Canva Code or Opal, which keep the training wheels on, or you can use full development platforms such as Cursor and Google Antigravity, which come with risks.

> COMMANDS FROM AI TOOLS INTERACT DIRECTLY WITH THE OPERATING SYSTEM

Vibe coding made my app possible. However, it only worked because the layer underneath the magic was still understood. In the age of AI-assisted development, the command line has quietly become important again. (HW)

JAMES ABELA

James is director of digital learning and entrepreneurship at Garden International School in Kuala Lumpur, Malaysia. He is founder of the South East Asian Computer Science Teachers Association and **ReadySetCompute.com**.

AUDITING AI FOR THE CLASSROOM

A step-by-step guide to evaluating large language models

Large language models (LLMs) such as ChatGPT, Claude, and Grok are increasingly used by teachers to generate lesson ideas, explain difficult concepts, and provide feedback. But do they respond differently depending on who's asking? In my audit, I found that teachers with non-CS backgrounds often received more pedagogically sound advice than those with CS experience, and surprisingly, veteran teachers with over 20 years in the classroom got the least personalised responses. These patterns raise important questions about how AI tools 'see' educators. This article shares what I learned while designing and running an audit study of LLMs in a high-school computer science setting, and gives you a step-by-step guide so you can audit AI tools yourself.

Why audit AI?

LLMs are powerful but imperfect. They may offer responses that are too shallow, fail to account for teacher experience, ignore educational standards, or perpetuate biases. Auditing LLMs helps teachers critically evaluate these tools before integrating them into instruction, ensuring that what students and teachers receive is accurate, appropriate, and equitable. It also helps you learn how to craft better prompts and interpret the answers you get.

How teachers can audit LLMs themselves

When I first started my audit, I thought it would be as simple as writing a few prompts and collecting answers. But my first attempts produced vague, repetitive responses that weren't very useful. Through several iterations, I refined my prompts, added context, and tested variations systematically, and the results improved significantly. Below I share what worked, along with tips based on my findings from reviewing over 600 LLM-generated responses.

- **Identify a specific teaching scenario**
  Start with a concrete instructional problem. Mine was teaching the concept of abstraction in a high-school computer science course — a topic students often struggle with. Picking a topic that is genuinely challenging helps you evaluate the LLM more meaningfully, because the advice it generates will need to be nuanced.

> ***TIP:*** *Avoid starting with something too broad ("How do I teach computer science?") — narrow it down to one skill, concept, or lesson objective.*

- **Create three to five versions of a prompt with slight variations**
  This was where my biggest evolution happened. My first prompts were very plain ("How can I teach abstraction?") and the answers reflected that — they were generic, uncreative, and not tailored to my context. On later tries, I specified the teacher's background and years of experience and included the classroom setting. For example:
  - "I'm a first-year teacher with a software development background. How can I teach abstraction to my high-school students?"
  - "I've been teaching high-school maths for 20 years but am new to CS. How can I teach abstraction?"

These refinements revealed something important. LLMs tend to give more relevant and useful advice when you give them a clear teacher identity and classroom context.

> ***TIP:*** *Include details about teacher experience, subject background, and even school type, if relevant. Try both novice and veteran teacher scenarios to see how the LLM adjusts.*

- **Use free or paid access to an LLM to generate responses**
  Run your prompts through an LLM (like ChatGPT, Claude, or Grok) and collect the responses. In my audit, I experimented with different temperature settings (which control how random or creative the output is — **helloworld.cc/ai-temp-setting**) and found that the overall quality of the responses stayed fairly consistent across the range. That said, it's still a good idea to try a few different temperature values for yourself to see how the responses shift with your own prompts and topic.

> ***TIP:*** *As you perform more audits, use the same prompt several times at different temperatures to check for consistency. Save all your responses so you can compare them later.*

- **Rate the responses using a simple rubric based on your goals**
  This step is critical for spotting patterns, comparing outputs, and reflecting on usefulness. Before scoring, decide which features are most important to you based on your goals. Are you looking for

clarity, creativity, accuracy, classroom realism, or differentiation? Choose four to six features that align with your teaching priorities or the challenges of your topic. I used a 1 to 5 scale to score each feature across all responses.

Here are a few examples from my audit:

- Tone: I looked for responses that were encouraging without being condescending, and that acknowledged the teacher's experience and context.
- Explanation of the concept: as abstraction is often misunderstood, I scored explanations based on clarity, correctness, and whether they broke the idea down in a way that fit the teacher's background.
- Pedagogical strategies: I gave higher ratings to responses that included realistic, actionable strategies (not just "explain it" or "use visuals") and addressed different ways students might engage with the topic.

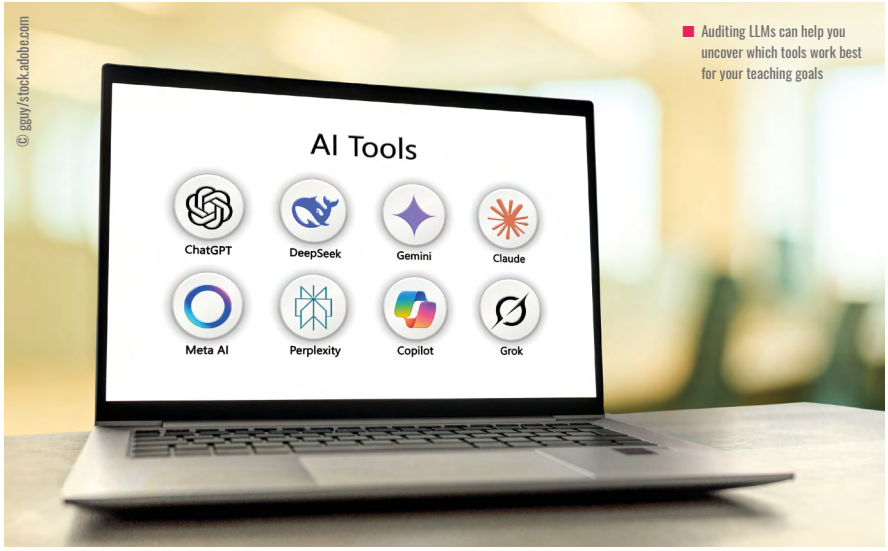
TIP: *At first, I rated LLMs informally, but creating a spreadsheet and using a 1 to 5 scale for each category helped me see trends clearly. For example, I noticed that novice teacher prompts got more encouraging tones but more generic advice, while veteran teachers sometimes received oddly flat or undifferentiated responses.*

Reflect on the responses

Once you've scored your outputs, step back and look at the bigger picture.

- Which responses are most useful and why?
- Where do they fall short? Are they too vague? Too advanced?
- Do you notice any biases or assumptions about teachers or students?

TIP: *In my audit, I found that teachers with non-CS backgrounds (for example history or education) often received more pedagogically sound advice than those with CS backgrounds, who got overly technical suggestions. Veteran teachers with over 20 years of experience surprisingly got the least personalised advice. These patterns can help you adjust how you use LLMs and figure out which prompts get you the best results.*



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Auditing LLMs can help you uncover which tools work best for your teaching goals

Share your findings

Even a short audit can uncover valuable insights, and sharing them can help colleagues in your department or professional learning community use AI tools more effectively.

TIP: *Summarise your findings and invite others to add their own observations.*

Why this matters

By auditing LLMs, teachers become more informed and intentional users of AI. You'll learn when to trust LLM advice, when to adapt or ignore it, and how to craft prompts that bring out the best in the tool.

For students, this skill is just as valuable. Teachers can even show students how to audit an LLM, helping them build critical digital literacy, understand the limits of AI, and develop the habit of questioning what these tools produce. When students learn to treat AI as a tool and not an authority, they become more thoughtful, creative, and independent learners.

Conclusion

As AI becomes more common in classrooms, teachers and students alike need strategies to evaluate its output critically. Audits are a practical and powerful way to better understand how LLMs work and to refine them so they align more effectively with your teaching goals. By taking time to test different scenarios and reflect on the results, you can use the strengths of AI while staying aware of its weaknesses. This helps keep AI as a helpful support for teaching and learning, rather than letting it take over. (HW)

KEVIN HARE

Kevin is a computer science teacher and curriculum designer at Canyon Crest Academy in San Diego, California, USA. He is the author of *Computer Science Principles: The Foundational Concepts of Computer Science* and founder of CS++ (**csplusplus.com**), where he shares resources for teaching computer science and preparing educators for certification.

AN ARTIFICIAL INTELLIGENCE COURSE FOR ALL STUDENTS

Gemma Moine discusses the impact on her sixth-form students of a super-curricular qualification focused on artificial intelligence

"I never planned on taking BTEC AI. When I didn't pick A-level computer science, I saw this as a back-up, but it ended up reshaping my entire academic path." These are the words of Marta, one of the many students at my school who has benefitted enormously from taking the Pearson BTEC International Level 3 Specialist Award in Artificial Intelligence Fundamentals (helloworld.cc/btec-ai-course). Over the past three years, this award has significantly enhanced our students' super-curricular profiles, providing a valuable asset for their personal statements for university.

GEMMA MOINE
Gemma is a secondary computer science teacher at The British School Al Khubairat and is an advocate for computer science in Abu Dhabi, United Arab Emirates (@BSAKAbuDhabi).

The structure of the qualification

This one-unit, Level 3 vocational qualification is designed to give students a foundational understanding of artificial intelligence theory and practice. While it doesn't carry UCAS points (points that count towards university and college applications in the UK), it fosters both technical skills and critical thinking — qualities that are sought after by universities.

It is delivered over one academic year in Year 12 (ages 16–17). At my school, the computer science department timetables one hour per week for the course, making it accessible as an enrichment course for students studying a wide range of A-level subjects. We've had students take this course with backgrounds in biology, business, and even art, demonstrating AI's vast relevance beyond just tech careers. The course is internally assessed through a portfolio and a final AI model project, which makes flexibility in delivery possible.

How the qualification is broken down

Section A: Understand artificial intelligence fundamentals

Students investigate different types of AI, their possible ethical implications, and how AI is used in different industries, from agriculture to e-commerce. From their research, students produce a report covering different AI concepts and definitions, and the advantages and disadvantages of how industries of their choice are currently utilising AI. One of our students, Eshaal, decided to do the BTEC as a bridge between her A-level subjects and her chosen career path of architecture.

USEFUL RESOURCES

- **Kaggle (kaggle.com):** real-world data sets and coding notebooks for student AI projects
- **UCI Machine Learning Repository (helloworld.cc/uci-ml):** clean, structured data sets for training and testing models
- **Google Colab (helloworld.cc/colab):** run Python code in a browser with free access to GPUs, ideal for developing AI models
- **AI Ethics Guidelines Global Inventory (inventory.algorithmwatch.org):** global ethical frameworks to guide responsible AI development
- **Google AI Blog (research.google/blog):** Google's latest AI research and real-world applications
- **Towards Data Science (towardsdatascience.com):** articles on AI, data science, and machine learning concepts and tools
- **Elements of AI (elementsofai.com):** a free, beginner-friendly course introducing core AI concepts and ethics

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Our students created AI models on a variety of topics, including air quality classification

She says, "I found the Section A brief to be particularly useful, as it was intriguing to research and gain insight into how AI directly impacts architecture, both positively and negatively. I was able to discover the extent to which architects should be using AI to improve report production and data analysis. However, it also raised the question of how AI can limit architecture where creativity is required, as AI does not necessarily produce original ideas."

Section A forms the basis for later sections and helps students build their confidence in discussing AI critically.

Section B: Explore machine learning and neural networks

Students research machine learning applications and techniques such as regression, classification, clustering, and association. They examine how each is used to solve various business problems. From their research, students create a report on the different types of machine learning and their use of machine learning algorithms, and the importance of data management.

Section C: Developing an artificial intelligence solution

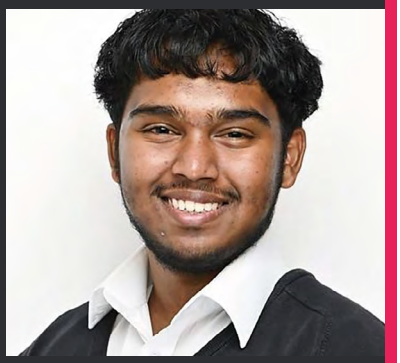
This is the practical part of the course, where students create their own AI model using a real-world data set, often with Python-based tools such as scikit-learn (**scikit-learn.org**), pandas (**pandas.pydata.org**), or TensorFlow (**tensorflow.org**). Students must produce a fully documented project portfolio that includes their chosen data set, code for building and training the model, visualisations of the results, and an evaluation of the model's performance. They are also required to reflect on challenges faced, explain how they addressed issues such as bias or missing data, and suggest improvements or next steps for their AI solution.

Examples of AI models that our students have created include:

- Classifying flower species using petal and sepal measurements
- Predicting and classifying air quality based on environmental factors such as PM2.5, NO_2, and proximity to industrial areas
- Forecasting taxi fares using data such as distance, time of day, and traffic conditions
- Predicting heart disease risk based on medical indicators
- Developing autonomous decision-making models for space exploration and Earth-based analysis
- Classifying cosmic particles using data from the MAGIC gamma-ray telescopes

We were the first school in the UAE to introduce this BTEC, and the qualification has allowed the computer science department to grow its existing super-curricular offerings. We've witnessed students from all walks of academic life uncovering new passions and skills that we hope will shape their futures. As AI becomes embedded in every profession, giving students a head start in understanding AI is more important than ever. (HW)

STUDENT PERSPECTIVES



Ryan's story

One of the things I enjoyed most was learning how artificial intelligence can address real-world problems, especially in the context of sustainable development. For Section C, I created an AI model using regression algorithms, random forest, decision trees, and linear regression to predict GDP per capita based on energy-related indicators from UN data sets.

My model aimed to support Sustainability Development Goal 7: affordable and clean energy by forecasting energy consumption trends. This unit has equipped me with valuable skills in data handling, model evaluation, and critical thinking, which I hope to carry forward as I pursue a career at the intersection of AI and sustainability.

Marta's story

I've always aimed for a career in medicine, but this BTEC helped me see how I could integrate my love for technology. For Section C, I developed a deep learning neural network to classify breast tumours based on bilateral dissymmetry. It was one of the most challenging yet rewarding projects I've ever done. The result? A renewed passion to work at the intersection of healthcare and AI.

MĀLAMA ʻĀINA: CODING TO RESTORE LAND AND IDENTITY IN HAWAIʻI

Josiah Hester discusses a project that integrates computer science education with Native Hawaiian culture, language, and environmental stewardship principles

Over a millennium ago, master Polynesian navigators crossed thousands of miles of open ocean in double-hulled voyaging canoes, guided only by oral and ancestral knowledge of stars, winds, currents, and birds. Upon arriving in Hawaiʻi, they transformed these isolated islands into a thriving civilisation. They created intricate agroforestry and aquaculture systems, from the mountains (ma uka) to the sea (ma kai), guided by traditional knowledge and rigorous observation (kilo).

Native Hawaiians (Kanaka ʻŌiwi) placed land (ʻāina), water (wai), and plants like kalo (taro) at the centre of life, stemming from the belief that they are the younger siblings of the taro plant (Hāloa), and establishing a profound responsibility for environmental stewardship.

This intergenerational responsibility for environmental stewardship, or mālama ʻāina, continues to guide Native Hawaiian communities today, inspiring a modern movement to blend traditional knowledge with cutting-edge technology for educational and restoration efforts.

Culture and computing: Mālama ʻĀina through micro:bits

In Hawaiʻi, computing education is vital to prepare students for careers and joining the workforce (much needed in Hawaiʻiʻs tourism-focused economy), but it can also be used to strengthen language, culture, identity, and feelings of responsibility (kuleana), for the land and waters that sustain them, much like students' ancestors.

The Mālama ʻĀina through micro:bits project is a culturally relevant, place-based physical computing curriculum for Native Hawaiian students. Place-based learning is a student-centred, immersive approach to instruction that uses non-classroom environments as the foundation for lessons, connecting classroom content to real-world context.

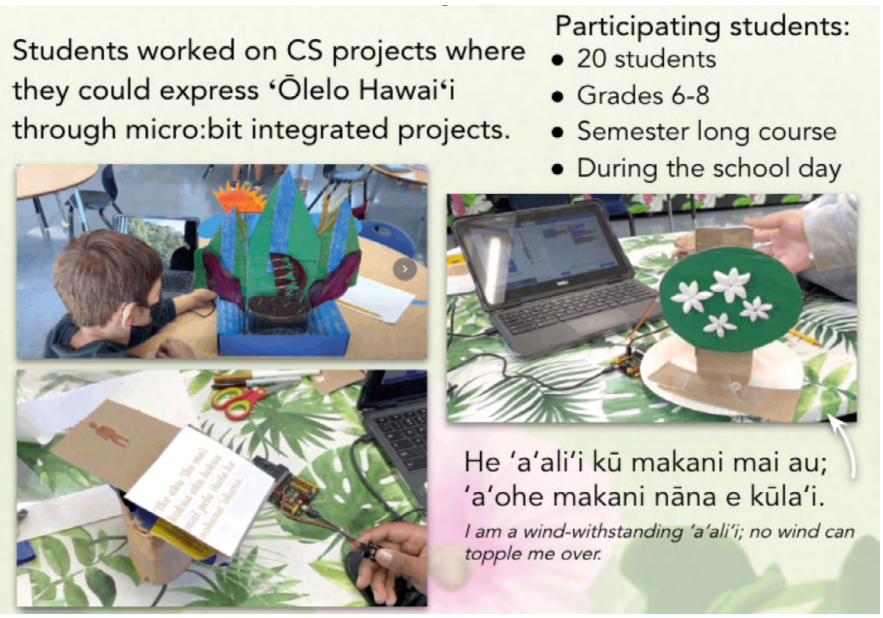
The project started at Pūʻōhala School, a Hawaiian immersion bilingual public school in Kāneʻohe, Oʻahu, Hawaiʻi, where instruction is delivered in the Hawaiian language (ʻŌlelo Hawaiʻi). Hawaiian immersion schools, such as Pūʻōhala School, are important repositories of culture, language, and traditions for Native Hawaiian communities and bring together a broad community of cultural practitioners who work with the students and teachers.

During the Mālama ʻĀina through micro:bits project, students worked at the Waikalua Loko Iʻa, a 400-year-old traditional 16-acre fish pond within walking distance of Pūʻōhala School, managed by the Pacific American Foundation. Located in Kāneʻohe Bay on Oʻahu's windward coast, this pond was once an important food resource for the community. At Waikalua Loko Iʻa, students learnt how this natural feature was transformed into an aquaculture facility that cultivated natural processes to maximise food production while improving ecosystem functionality and human well-being.

The Mālama ʻĀina through micro:bits curriculum in action

Students engaged in the ongoing restoration work of the site and community, using sensors, computing principles, and data science blended with traditional concepts of taking observations (kilo) and caring for and protecting the land (mālama ʻāina). The project combined disciplines to support bidirectional learning where environmental engineering, cultural competency, computing, and AI technology synergistically supported one another. Research shows that integrating sustainability and mālama ʻāina principles into CS learning — such as connecting loops and conditionals to both micro:bit programming and the logic of managing a fish pond (loko iʻa) — improves engagement and outcomes.

In one example, students built sensor



Improving engagement in CS learning through the principles of mālama ʻāina (caring for the land)

> STUDENTS LEARN HOW TECHNOLOGY CAN BE WIELDED IN SERVICE OF SOVEREIGNTY

systems with MakeCode to protect and monitor the fish pond. Students made connections between their micro:bit sensors (including light, ambient temperature, water temperature, and the level of dissolved solids), and sensors placed in the fish pond by local scientists. Students compared different data from different sites, along with their own observations, and then asked questions of the local experts at the pond.

In another example, students worked on CS projects where they could express Hawaiian language (ʻŌlelo Hawaiʻi) through micro:bit-integrated projects. One student chose the proverb "He ʻaʻaliʻi kū makani mai au; ʻaʻohe makani nāna e kūlaʻi", which means, "I am a wind-withstanding ʻaʻaliʻi [a native Hawaiian shrub]; no wind can topple me over" and wrote code that rotated a cardboard cutout painted like a traditional canoe. Other students interpreted proverbs about the moon and the first taro plant, all using micro:bits and coding as a medium to express their culture and identity.

Over the course of this programme, hundreds of curriculum modules were built, new words in ʻŌlelo Hawaiʻi were created to give meaning to CS concepts, and over 400 students and more than 20 teachers participated and continue to participate.

Supporting teachers (kumu) with culturally grounded AI

Unfortunately, one school revamping its curriculum is not enough to address 100 years of language suppression, alongside the significant lack of teachers who can speak ʻŌlelo Hawaiʻi and who have expertise in computing. A major barrier is that the cultural educational resources teachers need don't exist, especially not in ʻŌlelo Hawaiʻi, or for technical subjects like computer science.

This is why our team created Kumu Connect, a web-based AI application that produces classroom-ready lessons in English and ʻŌlelo Hawaiʻi (**kumuconnect.com**). Kumu Connect guides teachers through creating lessons with the necessary CS standards, the desired language, and appropriate cultural anchors using a community-curated data set of Hawaiian stories, proverbs, practices, and ecological knowledge — each specific to a classroom's land division (ahupuaʻa). Teachers can further augment these lessons with AI, deliver them from their device, or print a physical copy. Kumu Connect was iteratively co-designed and validated an MVP (Minimum Viable Product) prototype with over 50 teachers, and holds many of the lessons learnt from work at the fish pond and Pūʻōhala School.

JOSIAH HESTER

Josiah is an associate professor of computer science and interactive computing at Georgia Tech, where he builds sustainable computing systems for health, environmental sensing, resilience, and community-driven education, guided by his Native Hawaiian (Kānaka Maoli) heritage.

Reflections and the future

Place-based (ʻĀina-based) education brings together educators, cultural practitioners, and technologists to design physical computing projects that serve the land and community — whether that means monitoring water quality in restored fish ponds, tracking soil health, or building solar-powered long-range networks for remote data collection. Students program micro:bits and sensors while speaking, reading, and writing in Hawaiian, learning not only how technology works, but also how it can be wielded in service of sovereignty, securing the future of food, water, and land for future generations. This place-based, culturally rooted approach ensures that computer science education is not just about preparing for jobs in tech — it's about preparing the next generation to steward their lands, waters, and future. When our students code in their own language, for their own land, they are not just learning computer science — they are reclaiming and restoring land and identity. (HW)

DEVELOPING A CUSTOM AI ROBOT KIT FOR MAKER EDUCATION

From idea to innovation, Egypt's San3a Tech Academy share their journey of creating a robot kit to engage novice makers with AI and robotics

Teaching young people about AI and robotics is no longer optional. These fields shape how students understand the world and solve problems. Yet AI is often introduced through complicated tools and advanced programming languages that can intimidate novices before they even write their first line of code. At San3a Academy, Cairo (san3atech.com), we wanted to implement an approach that makes AI feel inviting — something students can touch, build, and experiment with from day one.

Our maker social enterprise needed a hardware platform that was beginner-friendly and capable of supporting modern AI applications. In Egypt, the kits available were either too difficult for novices to use or too expensive for classrooms. We needed something affordable, practical for large-scale educational use, and flexible enough for our constantly evolving programmes. This article walks through how we tackled that challenge by designing and developing our own physical computing kit from scratch.

Prototyping and the hardware journey

Our primary audience is students aged 5–18 who are encountering physical computing, programming, robotics, and AI for the first time. Our dilemma was how to teach complex fields like AI to total beginners without overwhelming them or over-abstracting the core topic.

We knew that text-based programming wasn't going to be an option; even simple AI tasks usually require advanced libraries and abstract thinking that can shut down curiosity. We soon found PictoBlox (**pictoblox.ai**), which offers a block-based programming environment and comes with AI and machine learning (ML) capabilities. It also supports the Arduino Uno board as a microcontroller. Our focus turned to developing a physical computing robot kit, based on the Arduino Uno board, that was fully compatible with PictoBlox.

We started by prototyping fast and learning from the mess. Our first step was to build a rough proof of concept using hardware already on our shelves. We used an Arduino Uno board along with an L293D motor driver chip, a breadboard, and some jumper wires. Nothing looked pretty, but these early iterations helped us understand how the robot could communicate with PictoBlox over Bluetooth and what the core functionality should feel like.

We built simple testing programs on PictoBlox that controlled the DC motors, different input sensors, HC-05 Bluetooth communication, and the PictoBlox AI and ML models. We faced a lot of challenges at the beginning with the compatibility of the Bluetooth module and PictoBlox, leading us to switch to the HM-10 Bluetooth 4.0 module. We were then able to successfully establish Bluetooth communication between our robot and PictoBlox, control all the input/output peripherals of the Arduino, and run the AI/ML models. At this stage, that proved the concept!

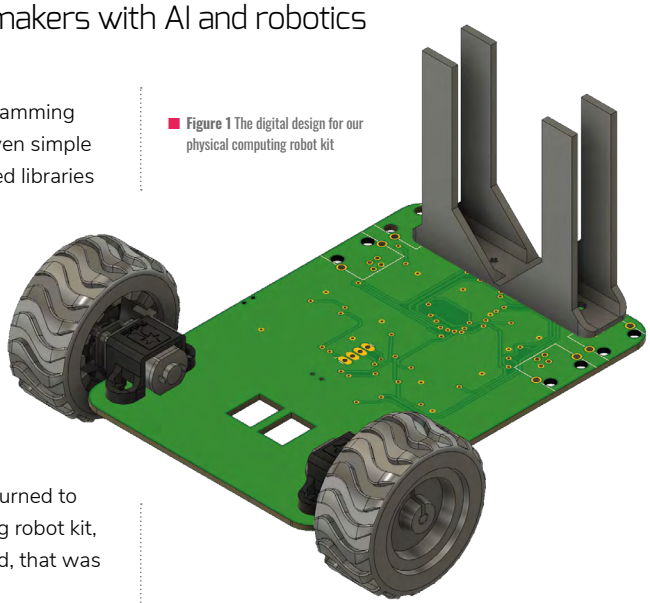


Figure 1 The digital design for our physical computing robot kit

The next challenge was replacing the breadboard with something more robust for the realities of the classroom. We chose a custom-printed circuit board (PCB) to cut down wiring complexity, improve durability, and reduce cost in the long term. We used Autodesk EAGLE (**helloworld.cc/eagle**) to design the PCB schematic and board layout. Deciding where every component should go while keeping in mind the kit's overall size and connection clarity was not straightforward. We wanted students to look

Our robot kit in action

at the board and understand instantly where things plug in and why (see **Figure 1**).

Once we received the physical boards, we then spent hours soldering every part into place. When the first LED turned on, the concept had officially crossed over into reality; our next challenge was how to transform this hardware into an experience that could turn a complete beginner into someone who understands programming, electronics, and AI.

The first pilots

We needed a structured learning journey, something engaging, fun, and confidence-building. At this stage, our content development is still in progress. We're currently crafting multiple sessions and challenges, each rooted in real-world themes like smart cities, industrial automation, self-driving cars, or interactive robotics. The vision is simple: every session presents a challenge and learners build a solution through hands-on making.

With this curriculum still under development, we piloted a small, one-hour workshop at Maker Faire Cairo 2025 to test the first version of the kit. We had eight participants from different age groups, who were new to AI and ML but had some basic Arduino experience. Although they weren't the ideal target audience, the pilot would help us answer questions such as whether the hardware could withstand active use; whether the PictoBlox would communicate reliably with the board; and whether learners would understand how to trigger the AI blocks and connect them to robot actions. We also wanted to test a one-hour learning journey, and the results were genuinely encouraging. Even within the short time frame, participants picked up the essentials of AI, ML, and computer vision, and successfully built a working program. It was a strong early signal that the kit could deliver a smooth, beginner-friendly learning experience.

Our next major test came during the Smart City Crash Course, one of our programmes designed for our target audience of novice learners aged 10 to 14. If the robot kit could succeed here, it would validate everything we had built. The robots appeared in the third session of the course, which was dedicated to introducing young learners to AI, ML, and the concept of thinking machines.

The way the robot works is simple. It is programmed using the PictoBlox smartphone app, which connects to the robot via Bluetooth. Once the program runs, the smartphone is placed in a 3D-printed holder mounted on top of the robot. The phone captures a live video feed, analyses it, and recognises specific objects. Based on what it detects, it sends serial commands to the robot's microcontroller to execute the corresponding actions. In this set-up, all the heavy video processing happens on the smartphone, while the robot simply receives and performs the instructions.

The results were promising. Learners understood the basics of how AI recognises patterns and makes decisions, and used these ideas to build a robot that could navigate their custom-built smart city.

AHMED IBRAHIM

Open-source contributor and education lead at San3a Tech, former educational content developer at MellBell Electronics, FabLab consultant for a USAID–Egypt STESSA project, and maker at heart, believing anyone can learn anything, Ahmed is often building robots, designing circuits, and occasionally sacrificing transistors to curiosity.

Future development

Looking back at this journey, one thing becomes clear: building an educational robot kit was as much a learning process for us as for the students who would eventually use it. One of the biggest lessons was allowing room for failure. Mistakes helped us uncover better designs and clearer teaching pathways, and led to a far more stable kit.

We plan to add dedicated ports so learners can plug in different sensors and actuators, opening the door to richer, more diverse projects. And we're working toward a protective enclosure that shields the electronics. These improvements will make the kit more aligned with real classroom needs.

But this project isn't just about a single robot. It's about a way of teaching, and a way of inviting young people into technology through curiosity, creation, and exploration rather than memorisation. If there's one message to leave with educators, curriculum designers, and makers, it's this: embrace approaches that let learners build with their hands. Let them test ideas, make mistakes, and see their creations come to life. When students can touch their own progress, the learning becomes unforgettable. (HW)

GAME ON! BRING SPORTS INTO YOUR CLUB OR CLASSROOM

New sports-themed Scratch projects

Sports have a way of bringing people together — whether you're cheering from the sidelines, playing with friends, or sharing stories about your favourite team. That same sense of excitement and teamwork can make coding feel more engaging for young learners. That's why our learning team have created four new Scratch projects inspired by sports from around the world.

In these projects, creators can enjoy cricket, kabaddi, and South Africa's traditional game of jukskei, or design custom kits for any sport. The projects invite young coders to explore global games while building their programming skills. Each activity blends creativity, culture, and fun, giving learners the chance to code and play in meaningful new ways.

Exploring the new projects

Project one: Cricket

In this cricket game, you'll program the bowler to send the ball towards a randomly chosen stump. The ball shrinks as it travels to create a sense of depth and realism. The game will call out where the ball is heading, giving players just enough time to move their bat and try to score runs.

What creators will learn: creators will use broadcast messages to coordinate bowling, batting, scoring, and wickets. They'll animate the ball's movement with loops, conditionally update variables to track balls, wickets, and scores, and trigger different outcomes depending on whether the bat connects. Complete the extra challenge to make the bails leap from the stumps for a dramatic wicket!

Project two: Kabaddi
Create a fast-paced tag game inspired by kabaddi, which originated in India. You must cross the line, tag opponents, and make it back safely, all while keeping your breathing going by tapping the space bar! Complete the extra challenge to make the opponents behave more unpredictably for even more excitement.

What creators will learn: players will animate movement using arrow keys, track lives and tags with variables, and use broadcast messages to coordinate opponents, wins, and losses. Opponents are created as clones and creators use loops and conditional logic to detect contact, manage the countdown timer, and trigger different outcomes depending on whether the player tags an opponent, runs out of time, or gets surrounded.

Project three: Jukskei
Jukskei is a traditional South African throwing game in which players try to knock over a wooden peg by throwing wooden pins (skeis) at it. It takes skill, aim, and timing.

What creators will learn: creators will build animations triggered by broadcast messages and controlled with key presses. They'll use condition-controlled loops to program sprite movement and sound effects, and update variables when conditions are met, to keep track of player scores.

Project four: Kit chooser
Many young people love showing support for their favourite teams, and designing custom kits gives them a fun, creative way to express that passion through code.

What creators will learn: using Scratch, young people will create their own kit chooser in which they can design custom sports kits, change colours using their own creative flair, and even add a toggle button to switch between styles.

Three top tips for educators and mentors

1. Bring cultural connections to the session
Ask creators if they have played or watched the featured sports, or if these games are popular in their communities. If they have not heard of some of these sports, why not show them some videos?

2. Celebrate different ways to play and participate
Many creators will relate to these sports in different ways: some may play them, others may follow teams, and some might enjoy the social or creative parts. Encourage them to personalise their game with their own rules, team colours, or sounds to reflect the way they engage with sport.

> THE EXCITEMENT AND TEAMWORK WE GET FROM SPORTS CAN MAKE CODING FEEL MORE ENGAGING FOR YOUNG LEARNERS

3. Support experimentation and iteration
Remind creators that sports and coding both reward practice. If something doesn't work the first time (a ball overshoots, an opponent behaves oddly, or a variable doesn't update), that's all part of the process. Guide them to debug step by step and celebrate each improvement as a skill gained.

Ready, set, code! Try these sports-themed projects in your Code Club or classroom and bring a burst of energy, culture, and creativity to your next coding session. (HW)

PETE BELL
A teacher for 23 years, Pete now creates engagement-led learning experiences for creators and support materials for educators. Outside of work he enjoys running, playing with his children, and brewing delicious craft beers.

The following lesson plan is taken from the 'Computing systems and networks — Communication and collaboration' unit from The Computing Curriculum (TCC), written by the Raspberry Pi Foundation. It is aimed at learners aged 10 to 11, to help them evaluate different methods of online communication.

ABOUT THE COMPUTING CURRICULUM

Raspberry Pi Foundation

The Computing Curriculum (TCC) is the Raspberry Pi Foundation's bank of free lesson plans and other resources that offer educators everything they need to teach learners aged 5 to 16. It covers the full breadth of computing, including computing systems, programming, creating media, data and information, and societal impacts of digital technology.

Every unit of work contains a unit overview; a learning graph to show the progression of skills and concepts in a unit; and lesson content, including a lesson plan, slides, and formative assessment opportunities. Find them when you sign up for a free account at **helloworld.cc/tcc**.

Communication

- When have you communicated with someone in the last week?
- Where were they, compared to you?
- How did you communicate with them?

COMMUNICATING RESPONSIBLY

Evaluating different methods of communication

This is the last lesson in The Computing Curriculum's 'Computing systems and networks — Communication and collaboration' unit. Learners use information provided in the lesson and their own prior knowledge to categorise different forms of electronic communication. They then choose which method or methods they would use for the scenarios. Through these activities, learners explore issues around privacy and information security. (HW)

AGE RANGE

10–11 years

OBJECTIVES

- Compare different methods of communicating on the internet
- Decide when I should and should not share information online
- Explain that communication on the internet may not be private

STARTER ACTIVITY: HOW DO YOU COMMUNICATE?

10 MINUTES

Ask learners to consider the following questions and write their answers on their whiteboards or on a piece of paper:

- When have you communicated with someone in the last week?
- Where were they, compared to you?
- How did you communicate with them?

Ask learners to stand up if the statement is true for them:

- Have you video-called someone?
- Have you communicated with someone in another country?
- Have you messaged someone on a gaming platform?
- Have you shared a picture with someone else?

ACTIVITY 1: COMPARING METHODS OF INTERNET COMMUNICATION

25 MINUTES

Ask learners to think–pair–share some methods of electronic communication. After learners have responded, show **Figure 1** to reveal eight methods of electronic communication and explain that today's lesson will focus on these methods.

Explain to the learners that they will have time to complete the table shown in **Figure 1**, to compare methods of communication. Ask them to think about what each column means.

Outline each of the categories shown in the table header:

Public or private? Public communication is visible to all; private communication may be restricted to certain individuals or groups. Many forms of internet communication (such as X, formerly known as Twitter) have settings to define how public or private their service is for individual users.

What is shared? This refers to different types of media: text, images, video, and audio.

One-to-one or one-to-many? Is the communication with one person or many people? Some services, such as WhatsApp, enable both.

Are there adverts? Is the service funded by advertising? This builds on another lesson in the 'Computing systems and networks' unit about how search engines make money (**helloworld.cc/searches-influenced**).

One-way or two-way? Most internet communication is two-way, but there are examples of one-way communication, such as YouTube videos, or blog posts that do not allow comments.

Age limit? Does the service have an age limit? If so, what is it?

You can find the completed table in the solutions sheet for the lesson (**helloworld.cc/communicating-responsibly**). This sheet includes notes that provide further clarification for a number of the responses. These notes can act as useful discussion prompts.

Activity 1

Complete the table

Type	Public or private?	What is shared?	One-to-one or one-to-many?	Are there adverts?	One-way or two-way?	Age limit
SMS						
Email						
Video call						
Internet instant messaging						
Blog post						
Video sharing site						
Social networking site						
BBC Newsround						

Figure 1

Activity 1

Public or private?

Think, pair, share: What do the words below mean?

Public

Something in open view

Private

Involving a particular person or group only

Activity 1

What can you share?

Text

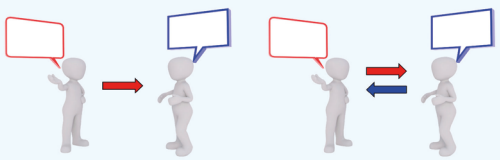
Images

Video

Audio

Activity 1

One-way or two-way?



One-way

Two-way

ACTIVITY 2: CHOOSING A METHOD OF COMMUNICATION 15 MINUTES

Divide your learners into groups. Assign one scenario in **Figure 2** to each group and ask the learners to consider how these scenarios fit some of the criteria from Activity 1 of this lesson.

- Is the scenario public or private?
- Should it be shared?
- Is it one-to-one or one-to-many?
- Is it one-way or two-way?

Then ask groups to decide which method or methods of communication they think their scenario is best suited to.

Give each group the opportunity to share their decision with the rest of the class. Stress that the learners should explain why they have made their choices.

Figure 2

Activity 2

How can you communicate?

Make arrangements to meet friends	Talk to a friend or relative in another country
Share pictures of a family holiday or special occasion	Advertise a school event (for example, a play or disco)
Wish someone a happy birthday	Publish a story that you have written

ACTIVITY 3: PLENARY

5 MINUTES

Show or review **Figure 3** and give each learner an exit ticket or a piece of paper. Ask learners to reflect on what they have learnt in this lesson. They should decide on the three most important things that they should consider when they are choosing how to communicate with someone using the internet.

Figure 3

Plenary

Exit ticket

On your exit ticket, list the three most important things that you should consider when choosing how to communicate with other people using the internet.

1.

2.

3.

RELEVANT LINKS

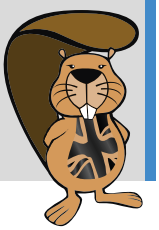
TCC 'Communicating responsibly' lesson: **helloworld.cc/communicating-responsibly**

THE BEBRAS PUZZLE PAGE

Each issue, **Andrew Csizmadia** shares a computational thinking problem for your students based on the work produced by the International Bebras Community

ABOUT BEBRAS

Bebras is organised in over 90 countries and aims to get students excited about computing and computational thinking. Last November, 526,000 students participated in the UK annual challenge. Our archived questions let you create your own automarking quizzes at any time during the year. To find out more and to register your school, head to **bebras.uk**.



DOMAIN

Algorithms, logic, and programming

SKILLS

Abstraction, decomposition, and evaluation

AGE

12–19 years

DIFFICULTY RATING

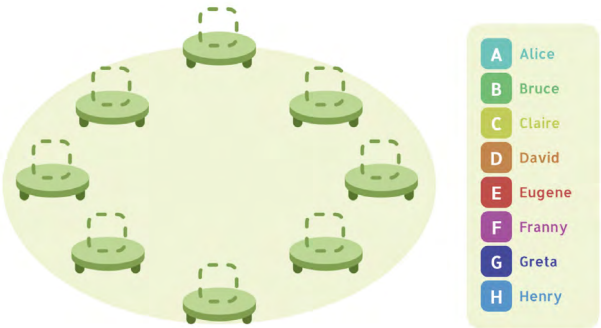
Age 12–14 hard
Age 14–16 medium
Age 16–19 easy

THE PROBLEM: SEATING ARRANGEMENT

Eight friends sit in a circle. They are all facing inwards.

We know the following facts about where they are sitting:

1. Alice sits directly opposite David.
2. Henry sits between Greta and Eugene.
3. Franny is not next to Alice or David.
4. There is one person between Greta and Claire.
5. Eugene is beside David, to David's left.



Task

Place the friends in the correct places in the circle by assigning the letter next to their name onto the correct chair. (There may be more than one correct answer.)

Background

This task involves applying logic, which is about following rules and understanding logical operators. The key operator students have to grapple with in this question is negation, which is used whenever we say 'not', and which allows statements to be reformulated in different equivalent ways. For example, Fact 3, which states that 'Franny is not next to Alice or David' can be stated differently as 'Franny is not beside (Alice or David)' which is the same as '(Franny is not beside Alice) and (Franny is not beside David)'.

Older students may be interested to know that the negation operator, NOT, changes the logical expression of 'NOT (A OR B)' to an equivalent '(NOT A) AND (NOT B)', which is an example of De Morgan's law.

Knowing how logical expressions can be rewritten, combined, or simplified is a very useful skill in computer science.

This puzzle was developed by the Bebras team in Canada, and reviewed and modified by members of the Bebras international community. The solution is on page 79.

KEYWORD SPOTLIGHT: BOOLEAN LOGIC

Defining everyday words and phrases in computer science

Boolean logic is a way of working with **true/false values** to make decisions in computing. It's named after George Boole and underpins how computers 'think', even though modern machines are incredibly complex. At its core, Boolean logic uses **Boolean values** (TRUE and FALSE) and **logical operators** to combine or compare conditions.

The three main operators students need to understand are AND, OR, and NOT.

- **AND** returns TRUE only if both conditions are true (e.g. logged in **and** correct password).
- **OR** returns TRUE if at least one condition is true (e.g. admin **or** teacher).
- **NOT** reverses a value (NOT TRUE becomes FALSE).

Boolean logic appears everywhere: in **'if' statements**, **while loops**, search filters, digital circuits, and game mechanics. Teaching it with real-world examples — like school rules, passwords, and filters on streaming services — helps students see how abstract logic controls real systems. (HW)

LET'S TALK ABOUT BLOCKS!

What is block programming?

Block programming is a style of programming in which you drag blocks of code that fit together like puzzle pieces. You've probably used blocks in Scratch, micro:bits, or Code.org's Hour of Code. The shapes and colours of the blocks represent syntactical information, while a toolbox gives students a way to explore visually the blocks available to them. Block programming makes syntax errors impossible: the blocks simply will not connect. The resulting code can always run, shifting the focus to debugging logical errors within a learner's program.

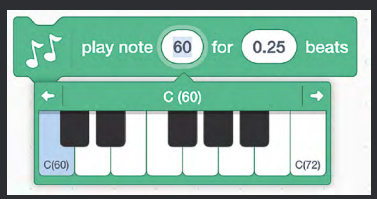
Block-based programming environments (BBPEs) combine a block editor with a library of application-specific blocks and a way to run the code. BBPEs are often used to program animations, robots, and mobile apps. A single block may represent a large amount of text code, allowing learners to work at a high level of abstraction as they start engaging with a topic.

Did you know that those programming environments are built on an open-source software library called Blockly? Blockly is the quiet foundation to your favourite coding tools, from Scratch to Microsoft MakeCode to MIT App Inventor. This reusable code is freely available for others to incorporate into their own applications. The project was founded by Neil Fraser at Google in 2011. In 2024 the Blockly team joined the Raspberry Pi Foundation, and we are excited to work with researchers and educators to make Blockly even more useful.

Using a common library across coding tools helps students have a consistent experience: blocks will drag and click together in predictable ways, even as students use different programs for different topics. It also centralises development work: a bug can be fixed in one location instead of in many. Blockly is responsible for dealing with all sorts of details, from browser compatibility to internationalisation.

WHY BLOCK PROGRAMMING?

- **Always executable**
  Without syntax errors, a program is always runnable. Learners can immediately move to running and debugging their program logic.
- **No semicolons, no parentheses, and no whitespace**
  Text programming uses special characters to specify syntax. Block programming uses shapes, so learners don't get tripped up by the difference between a space and a tab, or a semicolon and a colon.
- **Rich field editors**
  Numbers and strings can represent real things in the real world, such as piano keys. Block programming includes context-specific editors that show learners what type a parameter should be.



- **Pick your language**
  Most text-based programming languages use English keywords. With blocks, learners can code in their preferred written language, so they can focus on the concepts.
- **Pick your programming language**
  Block programming is an entry point to a wide range of programming languages and environments. Students can move on to Python for data science, JavaScript for web development, or C# for animation. This flexibility is great for learners who are still exploring what they can do with computers.
- **Toolboxes and palettes**
  Blocks are often used for robotics and animation, but every environment has different functions available. Blockly's toolbox makes it easy for a learner to see what they can do, encouraging exploration and experimentation.

What is the pedagogy behind Blockly?

Cognitive load theory says that our working memory is limited and overloading it can negatively impact our processing ability (**helloworld.cc/cl-theory**). Block programming is congruent with the Block Model framework (**helloworld.cc/block-model**). Block programming aims to reduce the extraneous load created by syntax and whitespace so that students can focus on the concepts and tasks. Block shapes present information in parallel with block text and make structure visible through colour.

When should I use blocks in the classroom?

You can use blocks to introduce concepts such as loops, sequencing, and variables without the friction of syntax. Your students can use blocks to create complex programs and projects to share with their friends. Blocks can be used in parallel with text to teach students the formal syntax and structure of a language. And you can even return to blocks later with your career-ready students to explore programming everything from Android apps to industrial robots. Blocks can be a helpful abstraction when talking about algorithms at any age or stage.

Microsoft MakeCode, the language used to program the micro:bit, is based on Blockly

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When moving from block-based programming to text-based programming, it's important to explicitly make the connections between block features and their corresponding features in your target text-based programming environment. Some environments, such as Microsoft MakeCode, manage this transition by letting students flip back and forth between the block and text representations of the same code.

Is it real code?

Sure is! Fundamentally, code is how you tell a computer what to do. There are lots of types of code, depending on the application. Some people write Python; others write ladder logic or assembly. And there are lots of ways to program, from typing text, to editing layout files, to prompting a large language model. Programming is about understanding a problem, breaking it into pieces, and writing code to solve the problem. Block code is just another way to represent instructions.

Many learners think that blocks are for kids because they started programming with blocks and later moved to text. But an author using a pencil and paper is no less real than an author writing on a computer or a phone, even if they first learnt to write on paper. One of the best parts of programming is the many different ways in which it lets us express ourselves.

What's next for Blockly?

The Blockly team is hard at work adding keyboard navigation and screen reader support to the library. Any program that uses Blockly will be able to add these features to their apps. Next we'll work on features to support teachers and curriculum developers. As we work on the library, we'll test it with students and teachers to get feedback, and publish best practice ideas for teachers using Blockly in the classroom.

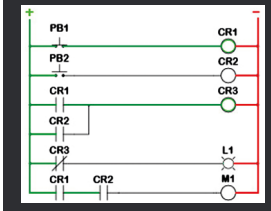
Stay tuned for more about blocks in future issues of Hello World! (HW)

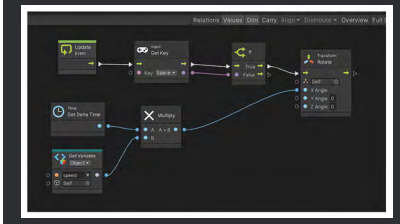
RACHEL FENICHEL

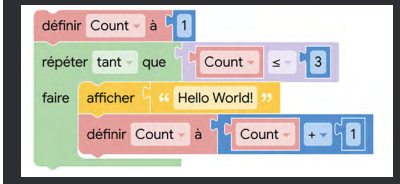
Rachel is the director of Blockly at the Raspberry Pi Foundation. She is currently working on a master's in education with a focus on accessibility in block-based programming environments.

WHICH OF THESE IS CODE?

(Hint: all of them!)








```
Count = None


Count = 1
while Count <= 3:
  print('Hello World!')
  Count = Count + 1
```

THE REAL IMPACT OF COOLEST PROJECTS

Exploring the evidence for the effect of Coolest Projects on young people's confidence, creativity, and sense of community

Every year, Coolest Projects brings together a global community of young digital creators who are eager to share and be inspired. But beyond the sheer creativity on display at the events, many educators ask: what is the real impact of Coolest Projects on young people?

To answer this, the Raspberry Pi Foundation conducts an annual evaluation to understand who is participating, what they gain, and how teachers can be confident that the experience supports meaningful learning. The findings from the Coolest Projects 2025 Impact Report (**helloworld.cc/cp-25**) offer clear, evidence-based insights into how experiences like Coolest Projects build confidence, creativity, and a sense of belonging for young people around the world.

Who Coolest Projects reaches

One of the most important findings in 2025 is how broad and diverse participation has become. Nearly 12,000 creators from 41 countries took part in the online showcase, a 57 percent increase on 2024. More than 500 young people participated across in-person events in Ireland, the UK, India, and the US, with an average participant age of 13.

Crucially for educators working to widen participation in computing, Coolest Projects reaches young people who are traditionally underrepresented in tech. This year, 92 percent of online showcase participants were from low- and lower-middle-income countries, and 51 percent identified as female. At in-person events, girls made up 63 percent of creators in India, 50 percent in the US, 39 percent in Ireland, and 37 percent in the UK.

Participating in Coolest Projects helps young people become more confident creators

The programme also supports learners early in their digital making journeys. Over half of in-person survey respondents said it was their first time making a digital project. Lizzie Jackson, youth programmes coordinator, shares, "A young person doesn't need to arrive feeling like a coder. Coolest Projects gives them a starting point and the confidence to keep going. It isn't about perfection. It's about potential and giving every young person the chance to discover what they can create."

Building confidence and belonging

The 2025 findings show a consistent pattern across locations and age groups: participating in Coolest Projects helps young people become more confident creators. Among online participants, 72 percent of young people and 100 percent of mentors agreed that their team's confidence in coding and making increased, and 89 percent reported improvements in digital making skills.

Young creators frequently spoke about how working on their project helped them push past their expectations of what they could achieve. As one young participant at Coolest Projects USA reflected, "I didn't know I could push myself this far to, like,

complete six full hours of coding and … create 100 plus lines of code and beyond."

Coolest Projects also fosters a sense of belonging. For some young people, traditional lessons can feel abstract or inaccessible, but Coolest Projects shows them that computing is full of people like them: creators with diverse identities, interests, and starting points.

In our poll, 74 percent of young creators said Coolest Projects helped them feel part of a bigger computing community, while 80 percent of online participants agreed that seeing projects from around the world helped them feel connected to others like them. As one young creator at Coolest Projects UK said, "It feels like I'm being noticed!"

For teachers, this sense of belonging is a powerful motivator. When students see their work recognised on a global stage, they often return to the classroom with renewed enthusiasm.

Motivation lasts beyond the event

Perhaps the most compelling insight is how strongly Coolest Projects inspires continued learning: 83 percent of young people and 100 percent of mentors said participation motivated them to keep exploring digital making. Young people described being inspired by the ideas of others, by the challenge of debugging, and by the thrill of bringing something imagined to life.

Alongside technical skills, participants reported developing a blend of transferable skills. Interviews revealed insights into how creating a project builds resilience, problem-solving, and creativity. As a young creator from Coolest Projects India explained, "Basically, while learning coding, the main skill which I learnt was problem-solving … we learnt by ourselves, we created projects, we found errors, and then we repaired them."

Others highlighted collaboration: for some, the event was a chance to connect with like-minded peers; for others, it strengthened friendships as they built something together. As one young creator at Coolest Projects USA said, "We [my friends and I] thought it was a really great opportunity and idea to make a project that we could all work on together and it's been really awesome getting to know these girls and working together, fixing whatever code that we made."

The increased confidence, sense of belonging, and motivation young people describe suggest that Coolest Projects can influence how they engage with learning more broadly, especially in hands-on, exploratory computing environments.

What this means for teachers

For teachers deciding whether to participate, the evidence is clear: Coolest Projects is a low-barrier, high-impact way to support digital creativity, computational thinking, and self-efficacy among learners. The programme welcomes projects at any stage, making it accessible whether your students are new to coding or eager for a challenge.

Evaluation findings also show that young people don't need high-tech equipment or extensive technical knowledge to experience meaningful impact. What matters is the opportunity to explore an idea, solve a problem, and share their work in a supportive community.

As Helen Gardner, Coolest Projects programme manager, summarises, "For those who've never imagined themselves in the world of technology, this experience can be transformative — and for many, it opens doors they never realised were there."

Getting involved is simple. Every project is welcome in our global online showcase, and young people can also join in-person events around the world. With evidence showing strong outcomes in confidence, sense of belonging, skills development, and motivation, teachers can feel assured that Coolest Projects provides a powerful learning experience. Find out more at **coolestprojects.org**. (HW)

SARAH LYGOE

Sarah is marketing manager of Coolest Projects and other informal learning products at the Raspberry Pi Foundation. With a computer science degree that opened doors during 20 years in fintech and start-ups, Sarah now supports educators by promoting accessible, creative digital making experiences that broaden young people's engagement with computing (**linkedin.com/in/sarahlygoe**).

WHERE IDEAS BEGIN

Coolest Projects welcomes creations at every stage, and many students start with simple problems they care about. Past entries include Scratch clicker games, well-being apps, accessible tools for classmates, and environmental sensors. These projects show how creativity grows when young people are encouraged to explore their interests and experiment; no specialist equipment or advanced coding experience is required.

THE CERTIFICATE IN APPLIED COMPUTING

A hands-on programme for the UK's Digital World Amendments

Launching now in Greater Manchester, UK, and also available for anyone to access, The Raspberry Pi Foundation's Certificate in Applied Computing has been created to help young people develop key digital skills. It's not a replacement for computer science, or a watered-down alternative, but a fresh, hands-on pathway designed to prepare young people for the digital tasks required in everyday life and in almost every career.

In Greater Manchester, this focus on practical digital skills is a key part of the Greater Manchester Baccalaureate (MBacc) — the city region's flagship approach to technical education (**helloworld.cc/mbacc**). The MBacc is designed to give young people a clear line of sight to high-quality jobs by linking technical learning to real employment opportunities in sectors that are growing in Greater Manchester. Digital skills are hard-wired into the MBacc because they are now essential across the economy, supporting access to careers in areas such as health, advanced manufacturing, and creative and digital industries, not just specialist technology roles.

The timing could not be better. Two major reports, the UK Government's *Post-16 education and skills white paper* (**helloworld.cc/post-16-skills**) and the Royal Society's *System upgrade required* (**helloworld.cc/system-upgrade**), make the case for urgent reform. Taken together, they paint a picture of extraordinary digital opportunities for young people, but also a shortage of resources to help them to seize them.

The UK's digital skills shortage

The scale of the UK's digital skills shortage is striking. According to government analysis, 7.3 million adults lack the essential digital abilities required in modern workplaces. The *Post-16 education and skills white paper* estimates that the UK will need 900,000 more skilled workers in priority sectors by 2030, however it also notes that only 48 percent of students leave full-time education with the digital skills employers expect.

The *System upgrade required* report highlights that this gap doesn't just slow economic growth — it also widens inequality, holding back the very people who could benefit most from well-paid, future-proof careers.

Through the MBacc, Greater Manchester is addressing this challenge by strengthening technical education routes that connect learning directly to employer needs, ensuring young people develop the digital capability required across the city region's key growth sectors. Specifically through the Certificate in Applied Computing, Greater Manchester will offer a structured, nationally recognised way for young people and adults to gain real, usable digital skills.

The Certificate in Applied Computing is a hands-on pathway that provides young people with the broad range of skills they need for the digital world they inhabit

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Challenges of the existing CS pathway in the UK

Although computing is compulsory from primary school to age 16 in the UK, the Royal Society report shows that the system is not delivering the outcomes the economy requires. GCSE computer science attracts only around 15 percent of students, with a 34 percent drop in combined ICT and computer science entries since 2015.

The numbers do not improve greatly at A level: just 6 percent of students take computer science, and it has one of the poorest gender balances of any subject.

And then there is the issue of perception. Many students, and critically, many teachers, view computer science as 'too difficult', 'too mathematical', or only suitable for a narrow group of academically strong learners.

Furthermore, the Royal Society highlights that 30 percent of secondary students attend a school that does not offer GCSE computer science at all. The Certificate in Applied Computing will widen participation by creating a qualification that feels achievable, relevant, and engaging, outside of the GCSE pathway. It emphasises applied digital skills, using technology that learners recognise from their everyday lives, and uses assessment methods that allow practical competence to shine.

The Certificate in Applied Computing will give schools and colleges an option that is more flexible to staff, easier to resource, and more adaptable to vocational pathways.

Reaching underserved groups

One of the strongest arguments for the Certificate in Applied Computing is that it will reach groups who are currently underserved by or excluded from the existing academic computer science pathway.

For girls and young women, the Royal Society highlights a persistent divide: only 20 percent of GCSE computer science students are female, and the UK has the lowest proportion in Europe of girls interested in computer science.

The Royal Society identifies that research shows girls tend to engage more with computing when it involves creativity, collaboration, social purpose, and clear real-world relevance — the very qualities that the Certificate in Applied Computing prioritises. By embedding design, digital media, problem-solving, and project-based learning, the Certificate in Applied Computing offers an environment where more girls will see themselves reflected and valued.

Students from disadvantaged areas also stand to benefit. Young people from these communities show strong curiosity about computing careers, yet face barriers such as fewer specialist teachers and restricted exposure to digital industries. A more practical programme will help overcome these obstacles by highlighting local digital opportunities and giving students the confidence that computing is not only for the highly technical, but for anyone with an interest in solving problems and working creatively.

Addressing the 'missing middle'

The government white paper sets a bold target: two-thirds of young people should be participating in higher-level learning — academic, technical, or apprenticeships — by age 25. Yet many who could thrive in digital and technical fields are locked out simply because they lack an accessible Level 2 or Level 3 foundation.

Addressing this 'missing middle' is a core ambition of the MBacc. By strengthening progression into technical pathways such as T levels and apprenticeships, the MBacc helps young people build confidence and momentum through employer-linked learning and high-quality workplace experiences.

The Certificate in Applied Computing will give learners a strong grounding in practical digital capability and fits neatly with the government's emerging emphasis on modular study, short courses, and the lifelong learning entitlement, offering young people an achievable entry point for reskilling or upskilling throughout their careers.

There is one argument that is both simple and compelling: computing is a broad discipline which includes digital communication, and almost every job now requires people to use digital tools confidently. The Certificate in Applied Computing reflects this reality, preparing our future nurses, designers, teachers, technicians, civil servants, entrepreneurs, and countless others with the broad range of skills needed for the digital world they already inhabit.

> "TWO-THIRDS OF YOUNG PEOPLE SHOULD BE PARTICIPATING IN HIGHER-LEVEL LEARNING

The time to act is now

The government, the science community, and educators all agree — reform is urgent. The white paper calls for a skills system that "leaves no learner behind", expanding access to high-quality training and supporting growth across all regions. Meanwhile, the Royal Society calls for a more inclusive and creatively oriented vision of computing education, one that reflects the diversity of modern learners and the needs of a digital society.

A Certificate in Applied Computing is not simply a new qualification; it is a strategic investment in Britain's future workforce. If we want more people to access high-quality jobs, if we want a more innovative and productive economy, and if we want computing to be a subject for everyone rather than a select few, now is the moment to act.

Call to action

Stage 1 of the Certificate in Applied Computing is live now! To register as an educator, go to **rpf.io/appliedcomputing**. You will be provided with a classroom code and guidance on how students can register for the certificate. Once your students have signed up with your classroom code, you will be able to follow their progress through the course.

For schools and colleges in Greater Manchester, embedding the Certificate in Applied Computing can help build practical digital skills into learning and support delivery of the MBacc. (HW)

BEN HALL

Ben is a senior learning manager at the Raspberry Pi Foundation, where he leads the team developing the Certificate in Applied Computing.

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The subject of ICT was removed from England's national curriculum over a decade ago, and young people now lack digital literacy skills

GIVING ICT ITS DUE

Gareth Funk discusses why a single qualification in computer science and digital skills cannot serve both disciplines

In 2012, the UK's then Secretary of State for Education, Michael Gove, set out an ambitious vision for the future of computing education in England. Removing the 'roadblock' of the ICT curriculum, he argued, would free schools to move beyond teaching Microsoft Word and Excel and towards a more intellectually ambitious subject. In his vision, 11-year-olds could be creating animations in Scratch, and by the age of 16, pupils might understand formal logic and be "writing their own Apps for smartphones" (helloworld.cc/gove-ict).

That vision shaped the reforms that followed. After the 2013 national curriculum review in England, the subject of ICT was removed and computing introduced in its place. Exam boards responded with new GCSE (formal qualifications for students aged 14–16) computer science specifications for first teaching in 2016, and GCSE ICT was discontinued. These changes were presented as a necessary modernisation aligned with the needs of a digital economy.

More than a decade on, it is reasonable to ask whether the correct balance was struck. While a minority of students do indeed leave school able to write apps or pursue computing further, many more leave unable to use common software packages confidently, organise themselves digitally, or troubleshoot routine problems with IT systems. Few people will ever need to write smartphone apps, but almost everyone will need to use computers competently in their everyday lives.

The myth of the digital native

One justification often offered for deprioritising the explicit teaching of digital skills is the idea that today's children are digital natives. Surrounded by smartphones and tablets, the argument goes, they instinctively understand technology and therefore do not require formal instruction in its use.

This assumption does not stand up to scrutiny. Earlier generations of so-called digital natives, those growing up with

home computers in the 1980s and 1990s, developed transferable competence precisely because the technology was unreliable and unforgiving. To play a game or complete a task often required tinkering: configuring hardware, installing software, resolving errors, or navigating crude interfaces. Skill was acquired through friction.

Modern devices are designed to eliminate friction. Smartphones and tablets are fast, stable, and highly abstracted. There is nothing to dismantle, configure, or repair; no drivers to install, no file systems to understand, no meaningful exposure to how a general-purpose computer actually works. As a result, proficiency with mobile apps does not translate into competence with desktop operating systems, complex software packages, or workplace IT systems.

> PROFICIENCY WITH MOBILE APPS DOES NOT TRANSLATE INTO WORKPLACE IT COMPETENCE

Children do not need to be taught how to open TikTok or stream a video. That does not mean they will intuitively learn to use spreadsheets effectively, manage files and permissions, or diagnose why a cloud service has failed to synchronise. These are learnt skills, and increasingly essential ones.

A useful comparison

An analogy from another part of the curriculum may help clarify the problem. In biology lessons, pupils learn about reproductive systems, hormones, and fertilisation. This knowledge is intellectually valuable, but on its own it does not equip young people to navigate relationships or make informed choices in their lives. That is why relationships, sex, and health education exists alongside biology, with a clear remit to teach practical, decision-relevant knowledge.

Most students could leave school without knowing the details of oestrogen regulation or the fetch–decode–execute cycle and suffer little practical disadvantage. However, leaving school without understanding reproductive health, or without basic digital competence, is a genuine handicap.

The error is assuming that a single qualification can serve both purposes. Just as biology cannot substitute for sex education, computer science cannot substitute for digital literacy.

Curriculum and assessment review

A 2025 independent review of the curriculum, assessment, and qualifications system in England acknowledged this gap (**helloworld.cc/curriculum-review**). It reported that nearly one in four businesses experiences shortages in basic digital skills, rising to over one in three for advanced digital skills. Expert stakeholders therefore called for GCSE provision to cover a wider range of topics beyond computer science, both to appeal to a broader cohort of students and to better meet society's needs. The review's diagnosis is sound, but its prescription is not: the review recommended replacing GCSE computer science with a broader computing GCSE encompassing the full breadth of the curriculum and explicitly including digital skills. The UK government accepted this recommendation in full. In my view, this is a mistake: it risks weakening computer science as a discipline, while doing little to address the digital skills deficit the review correctly identifies.

What should be done instead

Digital literacy, covering the use of desktop operating systems, common software packages, file management, security, and troubleshooting, should be explicitly defined, regularly updated, and taught to all students. This requires a clear place on the national curriculum, and should not be confined to an optional examination subject.

A more appropriate model already exists. ICT, or a rebranded equivalent, should be reintroduced as a compulsory curriculum component in the same way as relationships, sex, and health education: clearly specified, mandatory, and distinct from computer science. This provision must sit alongside, not instead of, GCSE computer science.

GCSE computer science has played an important role. Numbers of applications to study computer science at university have grown dramatically over the past decade, and the GCSE has provided a strong foundation for A-level study and beyond.

There is also a workforce consideration. The shift from ICT to computer science required substantial upskilling of teachers, many of whom were non-specialists. After a decade, the subject is now delivered at scale, despite ongoing shortages of specialists. Crucially, a rigorous academic subject makes teaching more attractive to subject specialists. Diluting the GCSE risks making the role less appealing, slowing recruitment and eroding the professional momentum that has been built.

By attempting to make one qualification serve everyone, we will serve no one well. Computer science deserves to remain a serious academic discipline. Digital skills deserve universal, explicit teaching. Collapsing the two into a single GCSE achieves neither aim. (HW)

GARETH FUNK

Gareth is head of computer science and digital strategy lead at St Mary's School, Cambridge, UK. Before that, he cofounded a tech start-up making Internet of Things insect-monitoring systems (**linkedin.com/in/garethfunk**).

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Your students may love VR, but does the technology align with your school's strategic goals?

THE EDTECH LITMUS TEST

An evaluation framework for selecting tools that work for your classroom

We have all been there. It's 9 pm on a Sunday. You have spent the weekend recharging and now you're doomscrolling through a list of the Top 50 Edtech Tools You MUST Use in 2026. They all look shiny. They all promise to revolutionise your classroom in unique ways. (Yes, all 50 tools are apparently completely unique.) And they all manage to make you feel slightly guilty for not using them yet.

The problem with edtech today isn't scarcity; it's noise. There are too many tools, too many logins, and there is too little time to figure out what works. It is a paradox of choice that paralyses even the most tech-savvy among us. As a computing lead in my school, my job isn't to find more tools, but to filter them. Over the years, I've been developing a litmus test — an evaluation framework teachers can quickly use to stop the endless searching and start selecting tools that solve problems. If a tool doesn't pass these five tests, it doesn't get into my classroom, or it will take some serious convincing from a colleague to persuade me to reconsider it.

Test one: Pedagogy first

Before you even look at the features or price tag, you need to apply the pedagogy-first rule. This is the hardest step. It requires you to be brutally honest about your school and your teaching. We often justify new tech with the assumption that students will figure it out because they are digital natives. However, we know that just because a student can swipe through TikTok, it doesn't mean they can navigate a complex learning management system or create a secure password.

Start with the problem, not the solution

Don't look for a tool until you can name the learning gap you are trying to close. If you say, "I want to use VR", you are starting with a solution or tool in mind. If you say, "My Year 4s struggle to visualise Victorian London, and static images aren't creating that empathic connection", you now have a problem that technology might be able to solve. If you can't write the problem down in one sentence, you probably don't need a new tool.

> THE TECH SHOULD BE THE LEAST INTERESTING THING IN THE ROOM, AND THE LEARNING SHOULD ALWAYS BE THE FOCUS

Let the learning take the lead

Are we teaching students how to use the tool, or are we teaching subject knowledge and skills? If a creative writing app has so many bells and whistles that students spend forty minutes choosing fonts and only ten minutes writing, the tool has become a distraction. The tech should be the least interesting thing in the room, and the learning should always be the focus.

Ensure the tool adds value

Does this tool just digitise a worksheet? If a digital quiz takes ten minutes to set up and offers the exact same learning value as a quick show of hands, you don't need it. Technology must offer added value: speed, scale, accessibility, or simulation.

Test two: Safety and ethics

As teachers, we used to just ask, 'Is it free?' Now, specifically with the explosion of unmanaged AI, we have to ask, 'Is it safe?', and 'I don't know' is not good enough in a school environment. You don't need to be a data protection expert, but you must check these three red lines below. If a tool crosses any of them, it has to be a hard no. We wouldn't leave the school gates wide open, so why do we take chances with our digital infrastructure?

Data ownership

Where does student data go? Find the answers to these questions:

- Does the tool have a clear data processing agreement (DPA)? If you can't find a 'privacy policy for education' link in ten seconds, avoid using the tool.
- If you are using an AI tool, is your students' work being used to train its public model? If the answer is yes, or if you can't tell, you shouldn't use it.
- If a parent asks to delete their child's data tomorrow, will the tool allow this? If the answer is no, walk away.

Reliability and bias

Do you understand where the tool gets its information from? Find the answers to these questions:

- If an AI tool gives a wrong answer (a hallucination), how will your students know? Does the algorithm have obvious biases? We need tools that support inquiry, not ones that just dispense unverified answers.
- Can you verify the tool's output? If the tool is a black box, it's not an educational tool, it's a guessing game.

Accessibility

Does the tool work for everyone? In a bring-your-own-device environment, or one with spotty data connections, it is critical that it is accessible for all. Find the answers to these questions:

- Does the software require the latest iPad, or will it run on a five-year-old Chromebook? Does it need high-speed streaming, or can it load on a slow connection?
- Does it create a privilege gap? If the tool only works well for students with expensive devices or fast home Wi-Fi, it's creating an inequality.

Test three: Trialling it

So, it solves a problem and it is safe. Now, will it survive a wet Wednesday afternoon with 25 energetic Year 8s who have not had a break all day? Trying to teach a lesson with untested software is like conducting an orchestra where half the musicians brought kazoos. Run these three stress tests first:

1. The mute test: turn the sound off on your device. Is the tool still usable? Classrooms are noisy places. If an app relies entirely on audio cues or voiceover instructions without subtitles, it will be chaos unless you have 25 pairs of working headphones (and let's be honest, you never do).

2. The three-click rule: can a student get to the actual learning activity in three clicks or less? If they have to navigate a complex menu, confirm an email, and select a distinct avatar before they answer a single maths question, you have lost 15 minutes of instructional time to technical friction.

3. The single sign-on test: if it doesn't support single sign-on, think twice. Do you really have time to manage 25 forgotten passwords?

Test four: Rolling it out

This is where most edtech initiatives die. The tool is great, the kids love it, but the roll-out is exhausting. Before you pitch this to leadership, you need to answer these three questions:

SETHI DE CLERCQ

Sethi is head of Key Stage 1 and the computing lead at Rugby School Thailand. Passionate about meaningful technology integration across all age groups, he shares training and tutorials on his YouTube channel, and writes on **sethideclercq.com** and **readysetcompute.com**.

1. How long does it take to learn this? If a tool requires two staff meetings just to understand the basics, it is too complex for a whole-school roll-out. Can you use a train-the-trainer model? Pick one digital champion per year group, train them for 30 minutes, and let them support their team. Do not drag the whole staff into a hall for an hour of 'click here, then click there'.

2. Who is leading the roll-out of the tool? If it's just you, and you get hit by a bus or get the flu, does the project die? Never implement a tool without a deputy. If you can't find a second person who is enthusiastic about leading this, you don't have enough buy-in yet.

3. Does the roll-out require cover? If teachers need release time to set up accounts or transfer data, that cost needs to be in your pitch. Free software isn't free if it costs three days of lesson cover to set it up.

Test five: Getting buy-in

So, you've found the perfect tool! Now, how do you convince your school to pay for it? Admins don't care about cool features; they care about solved problems and operational efficiency. Take these steps when pitching your new tool:

1. Align with your school mission: don't just say, "The kids love it." Think about how it aligns with your school's strategic goals, such as fostering independent inquiry, or whatever problem the tool is solving. Using the language of your school improvement/development plan, or linking it to a recent problem from an inspection or accreditation report, is a much better angle to lead from.

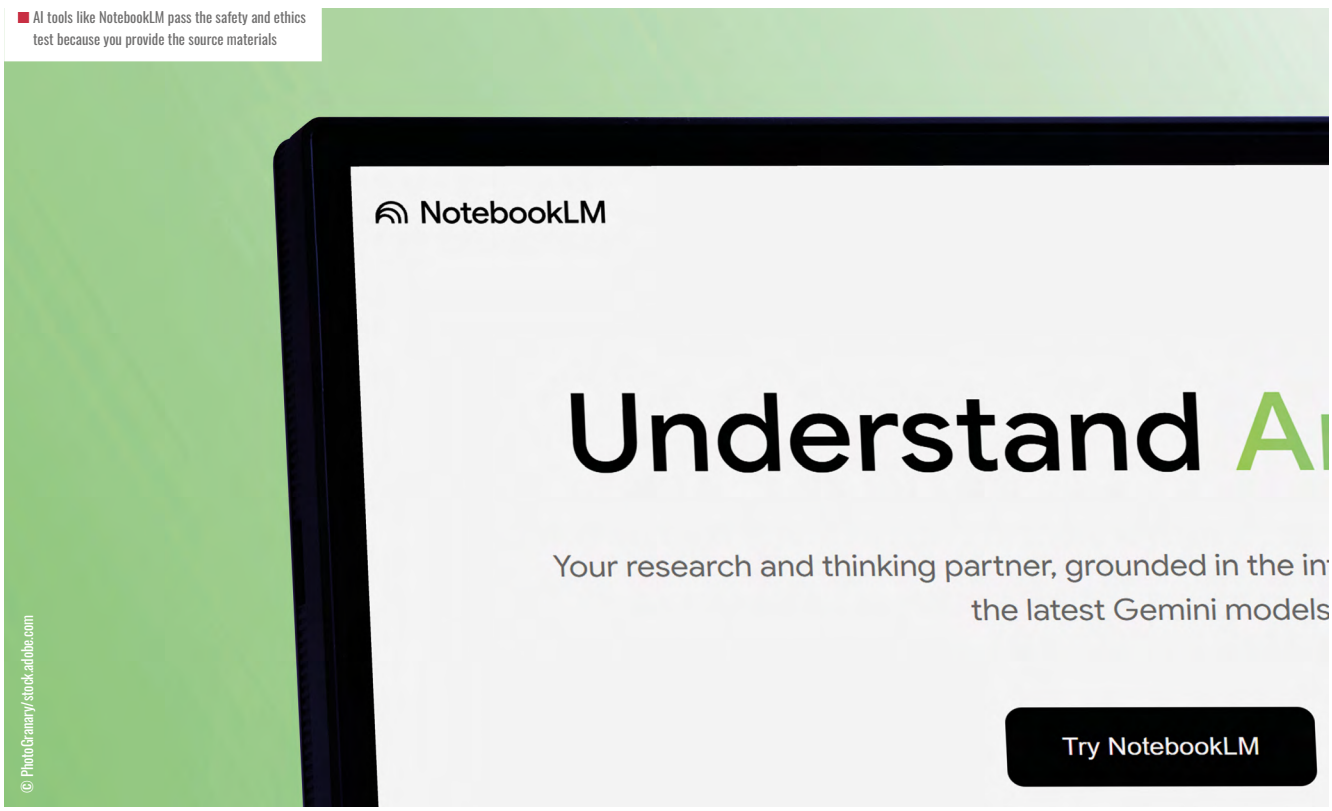
> THE MOST IMPORTANT QUESTION IS NO LONGER WHETHER A TOOL IS FREE, BUT WHETHER IT IS SAFE

2. Show the data: school leaders respond to data. Don't pitch the tool — pitch the time saved:

- Bad pitch: 'I want a subscription to QuizMeTool because it has fun animations.'
- Good pitch: 'I want a subscription to QuizMeTool because it reduces grading time by 40 percent, allowing teachers to spend that time on one-to-one student feedback.'

3. Ask for a pilot: this is the biggest secret. Don't ask for a permanent licence for the whole school. Instead, ask for a cheaper and time-contained pilot, and offer to then present a report on the impact of the tool. It is much harder for a finance director to say no to a small, contained experiment than a massive new budget line. (HW)

AI tools like NotebookLM pass the safety and ethics test because you provide the source materials



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CHEAT SHEET

Too long, didn't read?

Stick this on your desk, and use it every time a new tool lands in your inbox.

Test 1: Pedagogy first

- ◯ Write down the specific learning problem.
- ◯ Does this tool solve it better than pen and paper?

Test 2: Safety and ethics

- ◯ Is there a data processing agreement? Do you own the data?
- ◯ Is student data used to train AI models?
- ◯ Will this work on our oldest device?

Test 3: Trialling it

- ◯ Can I use it with the sound off?
- ◯ Can I get to the learning in under three clicks?
- ◯ Does it use single sign-on?

Test 4: Rolling it out

- ◯ Can a peer explain how to use this in 15 minutes?
- ◯ Do I have a deputy to help me run this?

Test 5: Getting buy-in

- ◯ Don't ask to buy the product; ask to pilot it.

  Draft the email: 'I've found a tool that solves _____. It passed the safety and stress tests. Can I run a pilot with Year 5 for four weeks to gather impact data? The cost of the project will be _____ and I will share the results with you at _____ (meeting or follow-up time).'

BETTER CAREER CONNECTIONS IN CS THROUGH SEMICONDUCTORS

Connecting what happens in code to what happens in hardware

For many of us, teaching computer science (CS) is both energising and fun. It's a content area that is constantly evolving, full of creative problem-solving, and endlessly rewarding to share with students. At the same time, teaching CS comes with real challenges. Too often, the concepts we introduce, like binary numbers, logic gates, and data representation, are taught in isolation or through abstract exercises. While these lessons are important, they can feel disconnected from the real industries and careers that exist just beyond students' classroom walls.

This gap matters. When students don't see how their CS learning is transferable across industries and links to tangible jobs in their region, we unintentionally reinforce stereotypes that computer science is 'just coding', 'only for programmers', or leads to distant, high-tech roles. We also miss out on opportunities to provide hands-on exploration that could make CS more salient for students.

Introducing semiconductor concepts into CS instruction can help bridge this divide. By connecting what happens in code to what happens in hardware, students can see how abstract ideas translate into real systems that drive modern technology. More importantly, semiconductors open the door to a wide range of career pathways — from technicians, to engineers, to designers — across every level of post-secondary preparation. Framing CS through the lens of semiconductors not only strengthens student understanding, but also makes clear that their skills have value in industries that are vibrant, local, and growing.

Semiconductors in the computer science classroom

Current curricula prepare students to understand the basics of machine-level code, but few develop an idea of how hardware uses that code to create the software they interact with daily. By creating connections to semiconductors, educators can deepen student understanding, broaden awareness of career opportunities, and spark curiosity about how software and hardware work together to power modern technology. As computing applications continue to expand into fields like AI and quantum computing, students who understand both hardware and software will become more well-rounded as scientists and better prepared for the workforce.

In recent years, K–12 computer science has expanded beyond

CSTA standard	Semiconductor connection	Classroom resources
3A-CS-01 Explain how abstractions hide the underlying implementation details of computing systems	The chips inside computers are built of millions of tiny transistors, which are electrical switches. These switches can be combined to build logic gates. When we write programs in high-level languages, the statements are human-readable abstractions. They all get compiled down to simple logic and memory commands built from transistors.	TryEngineering semiconductor resources (**helloworld.cc/try-engineering**) From Sand to Silicon: The Making of a Microchip | Intel (**helloworld.cc/from-sand-to-silicon**) Virtual experience of Cornell cleanroom (**helloworld.cc/cornell-vr**)
3A-CS-02 Compare levels of abstraction and interaction between application software, system software, and hardware layers		NNCI nanotechnology resources (**helloworld.cc/nnci**) Penn State nanotechnology lab manual (**helloworld.cc/nano-lab**)
3A-DA-09 Translate between different bit representations of real-world phenomena	Understanding how transistors work can help students understand why everything must be manipulated as binary at a hardware level.	SEMI Foundation resources (**helloworld.cc/semi**) SCALE K-12 resources (**helloworld.cc/scale-k12**) Chip In documentary (**helloworld.cc/chip-in**)
3A-DA-10 Evaluate the trade-offs in how data elements are organised and where data is stored	Increased efficiency and density in semiconductors let us increase the amount and speed of storage, as well as the speed at which we process data.	Integrated Circuits & Moore's Law: Crash Course | PBS (**helloworld.cc/crash-course-circuits**) Ada computer science: Computing systems (**helloworld.cc/ada-topics**)
3B-CS-02* Illustrate ways computing systems implement logic, input, and output through hardware components	We use transistors to build logic gates and implement complex logical operations.	Autodesk Instructables: Build an AND Gate From Transistors (**helloworld.cc/and-gate**)

* 3A standards are the standards for all high-school students, while 3B are intended for those who take advanced computer science courses

programming to emphasise computational thinking as a whole. This shift highlights how CS connects across fields and applications. **Figure 1** shows how CSTA standards (**helloworld.cc/csta-standards**) encompassing ideas like abstraction, decomposition, and problem-solving algorithms can be supported directly by integrating the application of semiconductors. For example, if students already know that 1s and 0s are the building blocks of logic, it's an easy step to connect this to 'on' and 'off' as the two states of tiny electronic switches. Hands-on activities showing these links can demystify computing and reveal the hidden role of hardware.

Strengthening conceptual understanding

Semiconductors also provide a powerful context for abstract CS concepts. Take Moore's Law: it is often mentioned in curricula, but rarely with the hardware innovations that make it possible (**helloworld.cc/moores-law**). Presenting the semiconductor fabrication process alongside Moore's Law helps students grasp why certain algorithms are more efficient or preferred. In this way, grounding abstraction in physical systems allows students to connect the dots in new and meaningful ways.

> "SEMICONDUCTORS HELP DISMANTLE THE STEREOTYPE OF CS AS 'JUST CODING'

Integrating connections to semiconductors doesn't require classrooms to have cleanrooms or advanced fabrication tools. A wide range of accessible resources exist to bring concepts to life. Low-cost microcontrollers, sensors, and boards can demonstrate how code interacts directly with silicon hardware. Online simulations model transistor behaviour, circuit design, and processor architecture without expensive equipment. University- or industry-developed modules, videos, and interactive labs can enrich lessons, while partnerships with universities, national laboratories, and industry engagement offer additional pathways for students.

Semiconductor concepts integrate easily with many common computer science curricula. For example, the popular AP CS Principles course already covers number systems (binary), data representation, and hardware abstraction. Integrating semiconductor concepts into a lesson on binary conversion can help students understand how this otherwise abstract concept is directly related to hardware capabilities, revealing the connections between topics.

Future careers

These activities can also introduce students to career paths they may not have considered. Highlighting the wide variety of skills and roles in semiconductor fabrication can inspire students to envision themselves in STEM fields. Additionally, resources showcasing the growing demand for workers in the semiconductor industry can motivate students to pursue CS at a time when AI is replacing many entry-level jobs. By leveraging these resources, educators can lower barriers to entry and help students connect abstract coding concepts with the physical systems that make computing possible.

By integrating semiconductors into CS curricula, educators can enrich student learning, strengthen conceptual understanding, and provide a clearer picture of how the digital world is built. These lessons not only ground abstract ideas in physical reality, but also prepare the next generation to innovate at the intersection of hardware and software.

More than 'just coding'

The tools to help us with this work in our classroom already exist: unplugged activities, low-cost microcontrollers, industry tours, and higher-ed partnerships that bring semiconductor work into classrooms. These approaches not only strengthen conceptual understanding, but also expand students' sense of what computer science can be — a discipline that blends creativity, problem-solving, and engineering with real-world impact. Most importantly, integrating semiconductors helps dismantle the stereotype of CS as 'just coding'. It opens doors to diverse career pathways in advanced manufacturing, hardware design, and emerging technologies, showing students that their skills are relevant, valued, and needed. As educators, our next step is simple: begin weaving these connections into our teaching. Even small lessons that surround CS concepts — such as abstraction — in tangible hardware can help students see themselves not just as coders, but as future innovators with the complete skill sets needed to shape the technologies that will define our world. (HW)

KATE LOCKWOOD

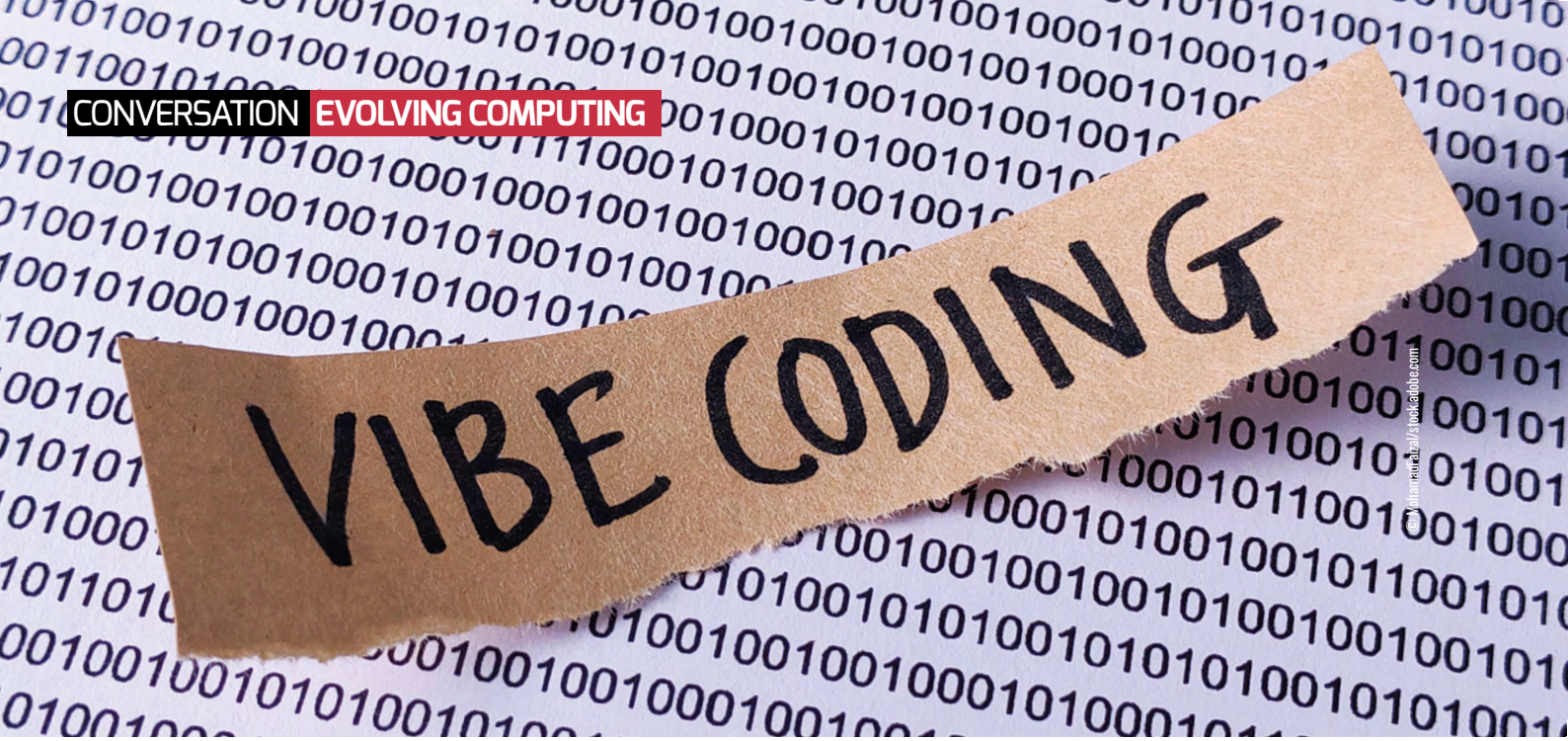
Kate teaches high-school computer science and engineering in St Paul, Minnesota, US. As co-president of the Minnesota chapter of the CSTA, Kate advocates for expanded access to computer science education for all Minnesota students.

CLAIRE DIETZ

Claire is the education and outreach coordinator at the Minnesota Nano Center, University of Minnesota, where she leads programmes connecting researchers, educators, and students to nanotechnology. She supports initiatives that foster community engagement and promote STEM education across Minnesota.

DR ALEXANDRA HOLTER

Dr Alexandra Holter is the K–12 computer science and career & technical education coordinator for Bloomington Public Schools. Dr Holter leads district-wide efforts connecting computer science and career pathways, partnering with industry and higher education to prepare students for future-focused learning and careers.



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WHY SHOULD YOU CARE ABOUT VIBE CODING?

Tracy Gardner and **Michael Conterio** examine vibe coding and the role it may play in the future of education

Collins Dictionary chose 'vibe coding' as their 2025 word of the year. Although different people have slightly different ideas about what it means, the term was originally coined by computer scientist and AI researcher Andrej Karpathy (helloworld.cc/wiki-vibe-coding). He described a process of prompting a large language model (LLM) chatbot to produce code, then pasting any errors he got when running the code back into the chatbot and telling it to fix them, not looking at the code himself. In this way, he could quickly get a working app for personal projects.

Coding without coding

This lack of interaction with the code distinguishes vibe coding from AI-assisted coding, where software developers use generative AI tools (such as Cursor or Codex) to automate specific tasks, but retain control over decision-making at the code level. By allowing people who are unfamiliar with coding to quickly create a functioning program based on their ideas alone, vibe coding has gained a lot of attention, and several coding platforms have been created or pivoted towards the process. Even Code.org's 'Hour of Code' has become 'Hour of AI', and includes activities to help young people learn to use vibe coding.

VIBE CODING TOOLS

These tools are all recommended in a general sense, but remember to evaluate vibe coding platforms for your context before using them.

- Canva AI Code Generator (**helloworld.cc/canva-ai**)
- Lovable × imagi Edu: vibe coding for classrooms — available for free during Hour of AI (**helloworld.cc/lovable**)
- Replit (**replit.com**)

What vibe coding can't do … yet

Although a vibe-coded app may 'work', professional programmers will need to think about wider issues such as user experience, security, performance, and regulatory compliance. Vibe-coding platforms are very aware of these issues and are increasingly making decisions for the user, for example preferring a particular database and automatically adding security features.

As recently as October 2025, Karpathy stated that he did not use vibe coding for his recent professional project, stating: "I tried to use Claude/Codex agents a few times but they just didn't work well enough at all and net unhelpful, possibly the repo is too far off the data distribution." This highlights how AI coding tools rely on training from existing code, so they don't work well for innovative or unusual projects.

Earlier this year, Karpathy used a new term — 'agentic engineering' — to describe how he and many other professional

NATURAL LANGUAGE PROGRAMMING

Natural language programming is progressing rapidly.

- Agentic programming is where an LLM plans, executes, tests, and iterates on a task (that the user prompted it with) over multiple cycles — no need for a human to paste errors back into the prompt (**helloworld.cc/agentic-ai**)
- In spec-driven development, the focus is on writing specifications that capture the intent of the system in a much more structured way than vibe coding prompts, while still using human language (**helloworld.cc/spec-driven**)

developers now program. Agentic means that the AI systems deal with error messages themselves, with developers providing oversight rather than writing most of the code directly. Engineering emphasises that "there is an art & science and expertise to it. It's something you can learn and become better at, with its own depth of a different kind".

Vibe coding and education

Whether vibe coding is useful for you in education depends on what your educational goals are. It can help learners to develop skills for tech roles with less of a programming focus, such as product owners tasked with deciding what features a product should have. It can also encourage students to think about the things computer programs can and cannot automate, as well as helping them learn how to turn user requirements into clear instructions. While vibe coding on its own probably isn't that useful for teaching programming, it can still spark an interest in programming among students who want more control, or who become curious about what is happening 'under the hood' of generative AI tools. Of course, no matter what your educational goals are, you will need to think about safeguarding and ethical concerns before using a vibe coding tool with your students.

TRACY GARDNER & MICHAEL CONTERIO

Tracy is a computer scientist, tech industry professional, technology educator, and co-founder of Flip Computing. Michael is a former physicist and now works as an online course production manager at the Raspberry Pi Foundation.

Working with programmers, not replacing them

Vibe coding is not yet an alternative to learning to program. Although students can potentially use generative AI tools to automate some tasks and help them with the learning process, they still need to learn how to manipulate code directly, and such skills remain highly valuable. Professional software developers may actually find that they are being given vibe-coded apps as prototypes, which they will then develop by maintaining the updated code and improving the code quality. Other projects, especially on the cutting edge of technology, will likewise be beyond vibe coding and will require expert programmers — at least for now!

Vibe coding and you

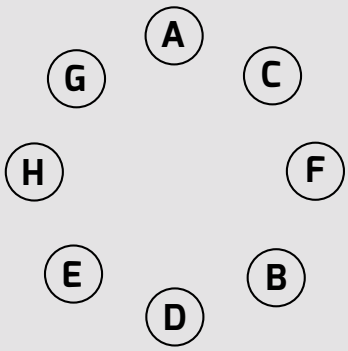
Is vibe coding useful for you, your students, and your learning goals? It is up to you as the teacher to decide how you will use the new technology to meet the needs of your students. Could you use it to help your students develop the skills they will need for the future through hands-on experience of using computation to create something to meet a goal? Could it provide a route into computer science for those who might otherwise have ruled it out? It's up to you to decide what you make of — or with — this new tool. (HW)

BEBRAS PUZZLE

BEBRAS PUZZLE SOLUTION: SEATING ARRANGEMENT

(PAGE 63)

The following answer assumes that Alice is placed in the top seat. There are in fact eight answers, as an answer can be found corresponding to Alice being in any of the seats.



Explanation

Fact 1, 'Alice sits directly opposite David', will enable us to seat David.

Now, Fact 5, 'Eugene is beside David, to David's left', enables us to seat Eugene.

At this stage, Fact 2, 'Henry sits between Greta and Eugene', tells us where Henry sits. Knowing where Henry sits, we now can place Greta.

With five friends placed, Fact 3, 'Franny is not next to Alice or David', leaves only one space for Franny.

Fact 4, 'There is one person between Greta and Claire', now tells us where Claire sits.

Finally, there is only one seat left and one friend to place, so we can place Bruce.

CODING, CREATIVITY, AND COMMUNITY SPIRIT: THE STORY OF WIRRAL CODE CLUB

From parent to Star Club leader in the North West of England

Since 2017, Wirral Code Club (wirralcodeclub.org) has been sparking curiosity, creativity, and confidence among hundreds of young people on the Wirral in the North West of England. This Star Club runs every Thursday evening, when Wallasey Library transforms into a bustling hub of discovery and lines of code turn into games, animations, and laughter.

Led by volunteer John, the club welcomes around 15 young people and their parents or carers each week. Though the club advertises itself as for ages 9 to 13, younger children — some as young as five — have joined in with enthusiasm and help from a parent.

Children grow in skill and confidence at Code Club, and parents do too!

Over the years, John estimates that around 800 young people have attended the sessions, not including those met through outreach at local MakeFests.

"We've seen children grow in skill and confidence, and parents too! Every session brings a new spark of creativity and it's amazing to see families travel from across the Wirral — sometimes over seven miles — just to join us," says John.

From parent to leader: how it all began

John's journey into Code Club started, fittingly, with his own children. "I first took them to a Code Club at Seacombe Library, run by a brilliant team of volunteers," he recalls. "The projects and resources from Code Club were fantastic; they really clicked with the kids. That's when I decided to volunteer myself."

With encouragement from librarian Elaine, and with a group of dedicated volunteers, John launched Wirral Code Club at Wallasey Library in 2017, and it has grown steadily ever since.

"It's amazing how something as simple as sharing a coding project can open up a whole world of learning and confidence," John reflects.

Libraries and learning: a perfect partnership

Wirral Libraries have played a key role in the Code Club's success (**helloworld.cc/wirral**).The partnership has flourished over the years, with libraries providing both the space and the spirit that make the sessions special.

WHAT ARE STAR CLUBS?

Star Clubs are a group of amazing clubs that help Code Club and its community grow and develop.

Star Clubs show what it takes to run a successful club, from sharing their knowledge to helping us test new projects. They regularly welcome potential new club leaders and mentors, giving them a friendly and enthusiastic introduction to running a club. This means you could visit a Star Club to see how it's done before you start your own Code Club.

You can currently find Star Clubs in these locations:

- England
- Kenya
- Minnesota, United States
- Scotland
- Wales

> IT'S NOT JUST ABOUT LEARNING TO CODE, BUT ABOUT BUILDING RESILIENCE, CREATIVITY, AND INDEPENDENCE

"The libraries serve as vital community hubs," John explains. "The IT suites are perfect for Code Club, and we've built great connections with other clubs, creators, and volunteers through the library network."

For Emma, one of the librarians at Wallasey Library, Code Club fits seamlessly with the library's mission:

"It supports our learning and engagement and digital strategies," she says. "We're developing skills in a young demographic — building confidence, learning, transferable skills, and employability."

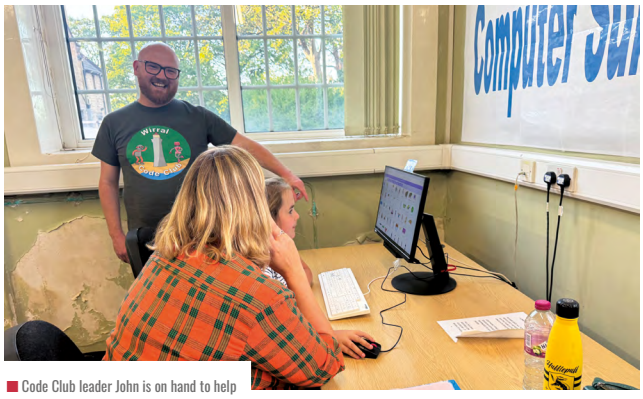
And it's not just coding that draws people in. When the club is in session, the atmosphere is bustling and engaged. Young people and parents often end up exploring books, borrowing micro:bits, and signing up for other library competitions and events.

The impact on young people and their families

The impact of Wirral Code Club is felt deeply by those who attend. For eight-year-old Erin, Code Club is a highlight of her week. "It's fun, chilled, and relaxing," she says proudly. "My first project was Ghostbusters. I was really proud of it. I didn't think I'd do that well!"

Parents notice the difference, too. Hannah, who brings her son and daughter to Code Club and has been attending for eight weeks, says: "I thought they'd need more help, but they're doing things I couldn't do. Watching them solve challenges on their own, it's fantastic."

These stories echo what makes Code Club so special: it's not just about learning to code, but about building resilience, creativity, and independence, and all in a supportive, community-driven environment.



Code Club leader John is on hand to help

Wirral Code Club runs in the local library

A ripple effect across the Wirral

Since its first session in 2017, Wirral Code Club has done more than teach digital skills; it has built a network of collaboration and curiosity that extends far beyond the library walls.

The club's influence can be felt in the community, from parents discovering their children's hidden talents, to librarians expanding their digital outreach, to volunteers forming lasting partnerships.

John, the volunteer team, and the Wirral Libraries team show how a simple idea like sharing coding with young people can grow into something powerful and lasting. (HW)

If you have been inspired by the story of Wirral Code Club, visit codeclub.org to learn how to start a club in your community or library.

ZOE DAVIDSON

Zoe is the community engagement manager for Code Club. She is the voice behind the Code Club newsletter and blog, and you can meet her online at Code Club coffee and conversation chats.

UNPLUGGED TOTS: INTRODUCE CHILDREN TO THE FOUNDATIONS OF COMPUTER CODING

Engaging screen-free activities to teach young learners the concepts behind coding

INFO **BY** Hannah Hagon | **PUBLISHER** Raspberry Pi Press | **PRICE** $24.99 | **ISBN** 9781916868229 | **URL** helloworld.cc/unplugged-tots-book

Mark Calleja

There is a particular kind of joy in watching a five-year-old realise that the world runs on patterns.

My daughter loves this sort of thing. If I ask her to help sort the washing, she will do it with theatrical seriousness. Whites here. Colours there. "These ones match because they both have flowers." What begins as domestic necessity quietly becomes classification, pattern recognition, and rule creation. She thinks she's playing: I know she's performing a small act of computational thinking.

This is precisely why *Unplugged Tots* feels so timely and so cleverly constructed.

Foundational computing concepts

Written by educator (and mum) Hannah Hagon, *Unplugged Tots* introduces young children (aged about 2 to 8) to foundational computing concepts without any screens, devices, or logins. Instead, it uses short comics and hands-on activities to explore ideas such as decomposition, sequencing, algorithms, pattern recognition, logic, and mapping. Each concept is introduced through storytelling, then grounded in a practical, real-world task. It's ace.

The pedagogical stance is play-based and deliberately naturalistic. Everyday activities become vehicles for abstract reasoning: a recipe becomes an algorithm, a nature walk becomes a noisy hunt for repeating sequences.

For the classroom or home

For educators, one of our constant challenges is catering simultaneously to the child who is intrinsically curious and the one who doesn't really want to be there. We want to provide genuine intellectual growth, but we also want the experience to feel joyful, voluntary, and empowering.

Unplugged Tots gets this. The activities are intentionally low-barrier, with minimal set-up, familiar materials, and short time commitments. The book's tone is invitational and accessible — perfect for non-specialist parents and early-years practitioners who feel intimidated by computing vocabulary.

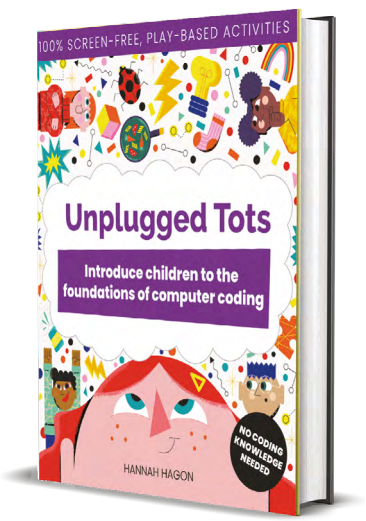
From a classroom perspective, these activities align naturally with early learning frameworks: sorting and categorising, following instructions, noticing patterns, and sequencing events. In a Code Club context, they provide an elegant on-ramp to coding, particularly for younger siblings, bigger Code Clubs, or community group sessions where devices are scarce.

More importantly, these activities cultivate the habits of mind that underpin later technical fluency in computer science concepts. When a child learns to break down 'make a sandwich' into ordered steps, they are rehearsing algorithmic thinking. When they spot a pattern in a line of leaves, they are engaging in abstraction. When they test and adjust a biscuit-icing plan, they are debugging. And none of it ever feels like a lesson.

Engaging with the world

In my experience, the most powerful learning moments rarely announce themselves; they slip in sideways. A laundry game becomes data sorting. A treasure hunt becomes conditional logic. The language comes later; the cognitive architecture is already forming through play.

For schools and parents who are concerned about screen time, this book offers a credible alternative that doesn't dilute rigour. It shows young people that computational thinking is not dependent on devices; it is a way of engaging with the world. (HW)



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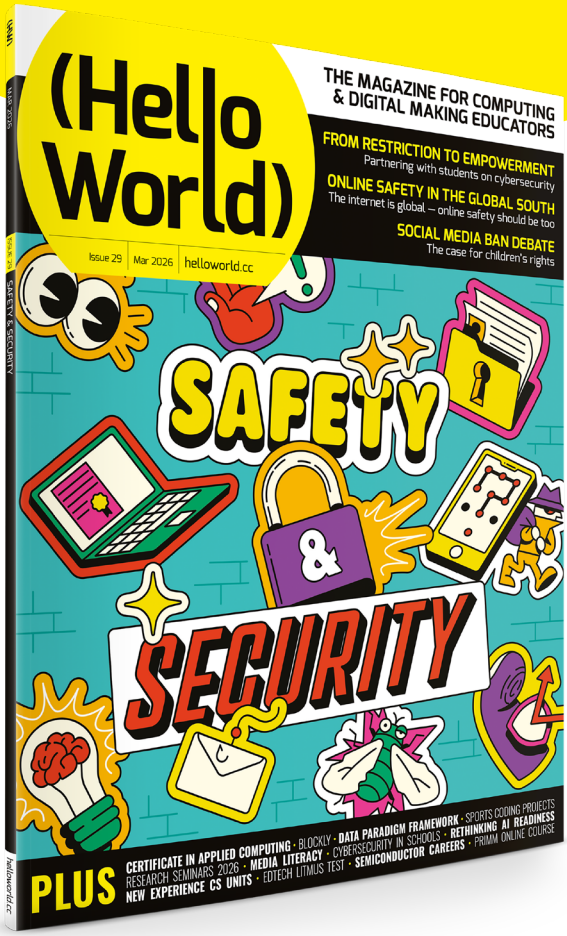

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